TECHNICAL SUPPORT DOCUMENT
AND
STATEMENT OF BASIS

FOR CONSTRUCTION OF

DRAKE CEMENT, L.L.C.
PORTLAND CEMENT PLANT

Air Quality Permit Number 1001770

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I. INTRODUCTION

This operating permit is issued to Drake Cement, L.L.C., the Permittee, for operation of a Portland cement manufacturing plant and quarry located in the town of Drake (approximately 40 miles north of Prescott) in Yavapai County, Arizona. The proposed Portland cement plant will produce up to 2,000 tons per day and 660,000 tons per year of clinker.

A. Company Information

Facility Name: Drake Cement, L.L.C.
Facility Address: CR 71, Drake, Arizona 86334

B. Attainment Classification

The air quality control region in which the subject facility will be located either is unclassified or is classified as being in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants: particulate matter less than 10 microns (PM-10), particulate matter less than 2.5 microns (PM-2.5), nitrogen dioxide (NO_2), sulfur oxides (SO_2), carbon monoxide (CO), lead (Pb) and ozone (O_3).

II. PROCESS DESCRIPTION

A. Limestone Quarry Operations

The manufacture of Portland cement begins with mixing three basic raw materials (limestone, iron ore, and aluminum) in proper proportions to achieve the ultimate product desired. Limestone provides calcium, which is the major component of Portland cement. The limestone will be obtained primarily from an adjacent quarry and will be transported to the cement plant by a series of three overland conveyor belts.

Blasting in the quarry will utilize a mixture of Ammonium Nitrate and fuel oil (ANFO) as the blasting agent and will produce approximately 88,000 tons of limestone rubble per month. Limestone rubble will be loaded to quarry trucks using front-end loaders. The trucks will transport the limestone rubble to a primary crusher, with integral vibrating screen, in order to achieve a material screen size of three inches or less. From the primary crusher, the crushed and screened limestone material is transported to the Portland cement plant using a series of three overland conveyors.

B. Cement Manufacturing Facility

The Portland cement plant comprises four distinct operations:

- Raw material receiving, milling, blending and storage,
- Coal preparation and pulverized Coal storage,
- Pyroprocessing, clinker production and storage, and
- Finish milling, cement storage, and load-out to shipping vehicles and railroad.

1. Raw Material Receiving, Milling, Blending and Storage

Raw materials to be received for the production of Portland cement include two grades of limestone (termed High and Low in reference to calcium content), an iron source (e.g. from iron oxide), an aluminum source (e.g., from high aluminum containing minerals such as Bauxite), coal, and gypsum. Most of the limestone and part of the low aluminum source material will be obtained from a quarry adjacent to the plant site as described in Section II.A. The other raw materials (iron ore, pure aluminum source, coal, gypsum or alternative imported limestone) will be delivered to the site by truck or railcar. Except for gypsum, all raw materials that reach the site via the overland conveyor belts, truck, and rail will be temporarily stored in piles that will be completely enclosed in a building. Gypsum will be stored in open piles.

As needed, the coal, iron ore, and aluminum source will be reclaimed by an underground conveyor. Materials from the two covered limestone piles and from the outdoor gypsum storage pile will be reclaimed by enclosed reclaim conveyor belt. Each of these materials will be transferred via conveyor belt to dedicated raw material silos.

Raw materials fed from each silo will be proportioned by ratio control in the proper amounts using weigh scales on the conveyor belts and variable speed conveyors. The proportioned raw materials are dried, pulverized and size-classified in the raw mill circuit. The raw mill circuit includes an impact hammer crusher which works in negative pressure, a static separator, 4 cyclones, a fan and a ball mill. The static separator will insure the desired particle size cut that the mill requires. Hot exhaust gas from the pyroprocessing system (see Section II.B.3) is fed to the impact hammer crusher to dry and convey the ground materials. The resulting ground raw material, called "raw meal," is delivered to a blend silo. From the blend silo, the raw meal will be conveyed to the six stage preheater tower.

The raw mill system vented conveyance gases are routed through the Kiln Baghouse, then to the Main Stack, and vented to atmosphere. During periods when the Raw Mill is out of service, including periods of routine maintenance, the exhaust gases from pyroprocessing will bypass the mill and will vent directly to the Kiln Baghouse and Main Stack.

2. Coal Preparation and Pulverized Coal Storage

From the coal storage silo, coal is transported via conveyor belt to a mill where it is pulverized. The coal mill will use hot gases from the kiln for drying purposes. A cyclone will be used to remove the raw meal dust loading from the kiln exhaust gas so that the raw meal dust will not contaminate the coal.

The kiln at Drake Cement will use the indirect firing system. The pulverized coal exiting the mill and collected from the coal mill baghouse will be conveyed first to a pulverized coal silo and then to the precalciner and to the kiln burner. About 50 to 55 percent of the fuel will be routed to the precalciner, and the remaining 45 to 50 percent to the rotary kiln.

3. Pyroprocessing, Clinker Production and Storage

The formation of Portland cement clinker starts with the blended raw meal metered into the six stage preheater and then to the precalciner. (The customary terminology in the Portland cement industry requires that a calciner preceding a kiln is referred to as a "precalciner.") The preheater begins the process of dehydrating the raw materials, and then the precalciner eliminates up to 95 percent of the carbon dioxide from the calcium carbonate in the limestone. Hot gases exiting the rotary kiln rise through the six stages of the preheater. Pulverized coal fuel is introduced in a staged fashion to the precalciner in up to two locations. Thermal processing in the precalciner initiates the calcining reactions, and intimately mixes the materials prior to introduction into the rotary kiln. For preheating, dehydrating the raw feed, and calcining the precalciner consumes about 50 to 55 percent of the total coal fuel fed to the entire pyroprocessing system. Tertiary combustion air is introduced to the precalciner after being pre-heated in the clinker cooler and hood. Combustion gases carrying hot, calcined solids exit the calciner and are cleaned with a cyclone. The discharged solids from the bottom of this cyclone are introduced by gravity to the upper end of the rotary kiln. The cleaned hot gases exiting the top cyclone are split to the raw mill (approximately 90 percent of total flow) and to the coal mill (approximately 10 percent of total flow).

Calcined solids from the precalciner, and collected in the cyclone, are introduced to a rotating cylindrical kiln. It is this kiln, lined with refractory material, in which the chemical and physical processes leading to formation of "clinker" reactions are completed. The rotation of the kiln promotes mixing and better conversion of the solid material, and improves heat transfer from the gases to the solids. Additional pulverized coal is introduced in the kiln burner at the lower of the rotary kiln. Combustion air for the kiln is preheated as it is drawn in through several sections of the reciprocating-grate clinker cooler. The combustion gases pass counter-currently to the process solids in the kiln, raising the temperature of the solids to 2600 °F or higher and creating a strong oxidizing environment. Under these conditions, the finely pulverized raw materials undergo a complex set of chemical reactions, and the semi-molten mass fuses into small grayish-black lumps called clinker.

The hot clinker falls from the lower end of the kiln onto the moving grate of the clinker cooler where it is cooled by incoming air. The clinker then passes through a roller crusher prior to final grinding and storage.

Each of the five sections of the clinker cooler has a dedicated forced draft fan. Air from the first set of fans in the clinker cooler contacts the hottest clinker and is then sent to the kiln hood as secondary and tertiary combustion air. The secondary combustion air goes through the lower end of the kiln towards the kiln burner. The tertiary combustion air goes via a kiln bypass duct as combustion air for the precalciner. Air from the remaining fans is exhausted through a baghouse.

4. Final Milling, Storage and Load-out

The clinker discharged from the clinker cooler is conveyed to an enclosed storage structure. Clinker is then reclaimed using a ground-level conveyor system and is conveyed to a finish mill feed silo. This clinker, as well as gypsum and limestone, are transferred in appropriate proportions via weigh-belt feeders to a conveyor belt feeding the finishing mill system. The finish mill system consists of a complete Roller Press installation working in series with a ball mill. The Portland cement product is then transported to a cement silo for final storage before being loaded into trucks and rail cars.

C. Emergency Back-up Power Generation

The Drake Cement facility will include a 210 kW Diesel-fired Emergency Generator to supply power for the hot kiln turn around at slow speed, for the emergency cooling fan of the kiln burner, and for important illumination throughout the cement plant in the event of electrical transmission line disturbances and power outages.

III. EMISSIONS

A. Emissions Summary

Table III-1 presents a summary of the maximum annual emissions from the facility.

Table III-1. Emissions Summary

Emission Point	Emissions (tpy)				
	NO_X	SO_2	CO	VOC	PM_{10}
Main Stack	416.1	21.9	1,188	39.0	26.1
Clinker Cooler	0.0	0.0	0.0	0.0	9.7
Finish Mills	0.0	0.0	0.0	0.0	12.2
Conveying System Transfer Points	0.0	0.0	0.0	0.0	27.5
Unpaved Roads	0.00	0.00	0.00	0.00	8.46
Paved Roads	0.00	0.00	0.00	0.00	0.99
Emergency Generator Engine	0.29	0.09	0.25	0.11	0.01
Truck and Railcar Unloading	0.00	0.00	0.00	0.00	0.14
Gypsum Storage Pile	0.00	0.00	0.00	0.00	0.08
Limestone Blasting	2.15	0.25	8.46	0.00	0.14
Other Quarry Operations	0.00	0.00	0.00	0.00	0.06
Facility Total	**418.5**	**22.2**	**1,195**	**39.1**	**85.4**

B. Emissions Calculations

1. VOC and SO_2 Emissions from Main Stack

The maximum potential emissions of VOC and SO_2 from the main stack are based on emission limitations proposed by the Permittee. The VOC and SO_2 limitations are 39.0 tons per year and 21.9 tons per year, respectively.

2. NO_X Emissions from Main Stack

The maximum potential emissions of NO_X from the main stack are based on an emission limitation proposed by the Permittee. The NO_X limitation is 95 pounds per hour. The annual NO_X potential-to-emit

(PTE) is calculated as follows:

$$PTE_{NOx} = 95\frac{lbs}{hr} \times 8760\frac{hrs}{yr} \div 2000\frac{lbs}{ton} = 416.1\frac{tons}{yr}$$

The Permittee is also subject to NO_X emission limitations reflecting BACT as described in Section V.B.2 herein. These limitations do not affect annual PTE because, at maximum production rate, they are less stringent than the 95 lbs/hr limit, as shown in the following calculation:

$$BACT_{NOx} = 1.95\frac{lbs}{ton} \times 83.33\frac{tons}{hr} = 162\frac{lbs}{hr}$$

3. CO Emissions from Main Stack

The maximum potential emissions of CO from the main stack are based on the BACT emission limitation and the maximum allowable annual production level, as shown in the following calculation:

$$PTE_{CO} = 3.6\frac{lbs}{ton\,clinker} \times 660{,}000\frac{tons\,clinker}{yr} \div 2000\frac{lbs}{ton} = 1{,}200\frac{tons}{yr}$$

4. PM_{10} Emissions from Main Stack

The maximum potential emissions of PM_{10} from the main stack are based on an emission limitation proposed by the Permittee. The PM_{10} emission limitation is 5.967 pounds per hour. The annual PM_{10} PTE is 26.1 tons per year, calculated in the same manner as the NO_X PTE.

The main stack is also subject to a PM_{10} emission limitation reflecting BACT as described in Section V.B.1 herein. At the maximum expected exhaust gas flow rate, the main stack BACT emission limit is equivalent to the 5.967 lbs/hr limit, as shown in the following calculation:

$$BACT_{PM10} = 0.01000\frac{gr}{dscf} \times 69{,}613\frac{dscf}{min} \times \frac{1\,lb}{7{,}000\,gr} \times 60\frac{min}{hr} = 5.967\frac{lbs}{hr}$$

5. PM_{10} Emissions from Clinker Cooler

The maximum potential emissions of PM_{10} from the clinker cooler are based on an emission limitation proposed by the Permittee. The PM_{10} emission limitation is 2.223 pounds per hour. The annual PM_{10} PTE of the clinker cooler is 9.7 tons per year, calculated in the same manner as the PM_{10} PTE of the main stack.

The clinker cooler is also subject to a PM_{10} emission limitation of 0.005 gr/dscf as described in Section V.C herein. As with the main stack, the hourly PM_{10} emission limitation for the clinker cooler is equivalent to the clinker cooler BACT emission limit when operating at the maximum expected exhaust gas flow rate of 51,862 dscf per minute.

6. PM_{10} Emissions from Material Handling Dust Collectors

The maximum potential emissions of PM from the dust collectors serving the conveying system transfer points, finish mills, storage bins, and bulk loading operations are based on hourly emission limitations proposed by the Permittee. Due to the nature of these activities, PM_{10} emissions from these dust collectors are conservatively assumed to be equal to PM emissions. The hourly emission limitation and annual PTE for each dust collector are shown in Table III-2. The annual PTE for each dust collector is calculated in the same manner as the PM_{10} PTE of the main stack.

Each dust collector is also subject to a PM BACT emission limitation of 0.008 gr/dscf as described in Section V.D herein. As with the main stack, the hourly PM emission limitation for each dust collector is equivalent to the BACT emission limit when operating at the maximum expected exhaust gas flow rate. These exhaust gas flow rates are shown in Table III-2.

Table III-2. PM Emissions from Dust Collectors

Emission Point	BACT (gr/dscf)	Flow Rate (dscf/min)	PM lbs/hr	PM tons/yr
DC1.6	0.008	11,811	0.810	1.263
DC1.8	0.008	2,227	0.153	0.238
DC1.10	0.008	2,227	0.153	0.238
DC1.11	0.008	4,455	0.305	0.477
DC2.5	0.008	2,227	0.153	0.669
DC2.9	0.008	5,993	0.411	1.800
DC2.10	0.008	5,993	0.411	1.800
DC4.18	0.008	1,743	0.120	0.524
DC4.19	0.008	6,403	0.439	1.923
DC4.20	0.008	3,749	0.257	1.126
DC4.23	0.008	1,743	0.120	0.524
DC4.25	0.008	1,743	0.120	0.524

Table III-2. PM Emissions from Dust Collectors

Emission Point	BACT (gr/dscf)	Flow Rate (dscf/min)	PM lbs/hr	PM tons/yr
DC5.5	0.008	6,572	0.451	1.974
DC5.22	0.008	3,684	0.253	1.106
DC6.10	0.008	3,906	0.268	1.173
DC7.16	0.008	2,440	0.167	0.733
DC7.23	0.008	1,767	0.121	0.531
DC11.2	0.008	2,933	0.201	0.881
DC11.6.1	0.008	1,885	0.129	0.566
DC11.6.2	0.008	2,158	0.148	0.648
DC11.11	0.008	7,103	0.487	2.133
DC11.15	0.008	6,134	0.421	1.842
DC12.7.1	0.008	1,521	0.104	0.457
DC12.7.2	0.008	269	0.018	0.081
DC12.26	0.008	1,483	0.102	0.445
DC13.4	0.008	1,980	0.136	0.595
DC13.19	0.008	12,762	0.875	3.833
DC13.20	0.008	12,762	0.875	3.833
DC13.40	0.008	15,172	1.040	4.557
DC14.10	0.008	2,072	0.142	0.622
DC14.21	0.008	5,243	0.360	1.575
DC14.29	0.008	3,442	0.236	1.034

7. PM/PM_{10} from Paved Roads

Emissions from vehicle traffic on paved roads at the cement plant are calculated using the calculation methodology presented in Section 13.2.1 of EPA’s AP-42 emission factor compilation. Specifically, for each segment of paved road, the following equation is used to calculate emission factors in units of lbs per vehicle mile traveled:

$$E_{paved} = k \times (sL/2)^{0.65} \times (W/3)^{1.5} - C$$

Where:

E	=	size-specific emission factor (lb/VMT)
k	=	empirical constant, 0.016 for PM_{10} and 0.082 for PM
sL	=	silt loading, grams per square meter
W	=	mean vehicle weight, tons
C	=	emission factor correction, 0.00047 lb/VMT

For all paved roads at the cement plant, the silt loading is assumed to be 10.1 grams per square meter, based on data provided in AP-42 Table 13.2.1-4.

The mean vehicle weight for the paved roads is 25.8 tons, which represents the weighted average of the maintenance trucks (20 tons), the unloaded and loaded weights of the gypsum trucks (13 tons and 33 tons, respectively), and the unloaded and loaded weights of the customer cement trucks (14.4 tons and 40 tons, respectively).

The PM_{10} emission factor for paved roads at the cement plant is calculated as follows:

$$E_{paved} = 0.016 \times \left(\frac{10.1}{2}\right)^{0.65} \times \left(\frac{25.8}{3}\right)^{1.5} - 0.00047 = 1.16\ \text{lb/VMT}$$

Total vehicle miles traveled on paved roads in the cement plant are estimated to be 6,864 miles per year. As described in Section V.G herein, the Permittee is required to vacuum and water the paved road surfaces to meet BACT requirements. This control measure is estimated to reduce annual PM and PM_{10} emissions by 75 percent. Annual controlled PM_{10} emissions are calculated as follows:

$$PM_{10_{paved}} = 1.16\ \frac{\text{lb}}{\text{VMT}} \times 6{,}864\ \frac{\text{VMT}}{\text{yr}} \times \left(1 - \frac{75}{100}\right) \div 2{,}000\ \frac{\text{lbs}}{\text{ton}} = 0.99\ \frac{\text{ton}}{\text{yr}}$$

8. PM/PM_{10} from Unpaved Roads

Emissions from vehicle traffic on unpaved roads, including trucks on quarry roads and Caterpillar movement at the working face, are calculated using the calculation methodology presented in Section 13.2.2 of EPA’s AP-42 emission factor compilation. Specifically, for each segment of unpaved road, the following equation is used to calculate emission factors in units of lbs per vehicle mile traveled:

$$E_{unpaved} = k \times (s/12)^{a} \times (W/3)^{b}$$

Where:

E	=	size-specific emission factor (lb/VMT)
s	=	surface material silt content, percent
W	=	mean vehicle weight, tons
k	=	empirical constant, 1.5 for PM_{10} and 4.9 for PM
a	=	empirical constant, 0.9 for PM_{10} and 0.7 for PM
b	=	empirical constant, 0.45

For all unpaved roads, the silt content is assumed to be 8.3 percent, based on data provided in AP-42 Table 13.2.2-1.

The mean vehicle weight for the working face is 59.9 tons, based on the average of the unloaded weight (54.5 tons) and the loaded weight (65.3 tons). The mean vehicle weight for the quarry roads is 68.5 tons, which represents the weighted average of the unloaded and loaded weights of the Haulpak trucks (45 tons and 100 tons, respectively) and the unloaded and loaded weights of the water truck (13 tons and 21 tons, respectively).

Table III-4 shows the emission factors, annual vehicle miles, and annual uncontrolled PM and PM_{10} emissions from unpaved roads.

Table III-4. Uncontrolled PM/PM_{10} Emissions from Unpaved Roads

Road Segment	VMT (miles/yr)	Emission Factor (lb/VMT)		PTE (tons/yr)	
		PM	PM_{10}	PM	PM_{10}
Working Face	480	12.17	3.46	2.92	0.83
Quarry Road	10,380	12.93	3.68	67.08	19.08

As described in Section V.H herein, the Permittee is required to water the unpaved quarry road to meet BACT requirements. This control measure is estimated to reduce annual PM and PM_{10} emissions from unpaved roads by 60 percent. The total PTE from the unpaved roads is calculated as follows:

$$PM_{10_{\text{unpaved}}} = 0.83\frac{\text{ton}}{\text{yr}} + \left(19.08\frac{\text{tons}}{\text{yr}} \times \left(1 - \frac{60}{100}\right)\right) = 8.46\frac{\text{tons}}{\text{yr}}$$

9. Emissions from Emergency Generator

The emergency generator internal combustion engine has a nominal heat input capacity of 2.034 MMBtu/hr and a nominal electric output capacity of 210 kW. The engine is subject to a fuel use restriction that limits its operation to the equivalent of 312 hours per year, based on equivalent full-load operation, so its maximum annual operation is 634.6 MMBtu heat input and 65,520 kW·hr electric output.

For NO_X, CO, and PM, the engine is subject to equipment design standards representing BACT. These standards are expressed in units of grams per kW·hr electric output. Annual CO PTE is calculated as follows:

$$\mathrm{PTE_{CO}} = 65{,}520\,\frac{\mathrm{kW\cdot hr}}{\mathrm{yr}} \times 3.5\,\frac{\mathrm{g}}{\mathrm{kW\cdot hr}} \div 453.6\,\frac{\mathrm{g}}{\mathrm{lb}} \div 2000\,\frac{\mathrm{lbs}}{\mathrm{ton}} = 0.25\,\frac{\mathrm{tons}}{\mathrm{yr}}$$

Annual NO_X and PM PTE from the emergency generator internal combustion engine are calculated in the same manner as CO emissions. Emissions of PM_{10} from the engine are assumed to be equal to PM emissions.

For VOC and SO_2, annual PTE is calculated using emission factors from AP-42 Section 3.3. These emission factors are 0.35 lb/MMBtu and 0.29 lb/MMBtu, respectively. Annual VOC PTE is calculated as follows:

$$\mathrm{PTE_{VOC}} = 634.6\,\frac{\mathrm{MMBtu}}{\mathrm{yr}} \times 0.35\,\frac{\mathrm{lb}}{\mathrm{MMBtu}} \div 2000\,\frac{\mathrm{lbs}}{\mathrm{ton}} = 0.11\,\frac{\mathrm{tons}}{\mathrm{yr}}$$

10. PM/PM_{10} from Truck and Railcar Unloading

Emissions from unloading of solid materials from trucks and railcars are calculated using the calculation methodology presented in Section 13.2.4 of EPA's AP-42 emission factor compilation. Specifically, the following equation is used to calculate emission factors in units of lbs per ton of material transferred:

$$E_{drop} = k \times 0.00032 \times \frac{\left(U/5\right)^{1.3}}{\left(M/2\right)^{1.4}}$$

Where:

E	=	size-specific emission factor (lb/ton)
k	=	particle size multiplier, 0.35 for PM_{10} and 0.74 for PM
U	=	mean wind speed, miles per hour
M	=	material moisture content, percent

For coal, iron ore, limestone, and aluminum source, the moisture content is assumed to be 2.1 percent, based on data provided in AP-42 Table 13.2.4-1. The wind speed is assumed to be equal to 6.13 miles per hour.

The PM_{10} emission factor for these operations is calculated as follows:

$$E_{PM10,\,drop} = 0.35 \times 0.00032 \times \frac{\left(6.13/5\right)^{1.3}}{\left(2.1/2\right)^{1.4}} = 0.00136\,\frac{lb}{ton}$$

The maximum rates of material transfer are 250 tons per hour for the railcar unloading operation and 150 tons per hour for the truck unloading operation. As described in Section V.E herein, the Permittee is required to use water sprays to meet BACT requirements for these unloading operations. This control measure is estimated to reduce PM and PM_{10} emissions by 75 percent. Hourly controlled PM_{10} emissions from the railcar unloading operation are calculated as follows:

$$PM_{10_{rail}} = 0.00136\,\frac{lb}{ton} \times 250\,\frac{tons}{hr} \times \left(1 - \frac{75}{100}\right) = 0.085\,\frac{lb}{hr}$$

The maximum rates of material transfer at the railcar and truck unloading hoppers are limited by enforceable permit terms, with separate limits for the primary and alternate operating scenarios. Table III-5 shows the operating limitations and the maximum hourly and annual PM and PM_{10} emission rates for these operations under each scenario.

Table III-5. PM/PM_{10} Emissions from Railcar and Truck Unloading

Scenario/ Unit		Controlled Emission Factor (lb/ton)		Operating Rate		Emissions			
				tons/hr	10^6 tons/yr	Lbs/hr		Tons/yr	
		PM	PM_{10}			PM	PM_{10}	PM	PM_{10}
Primary									
	Rail	0.00072	0.00034	250	0.730	0.180	0.085	0.225	0.106
	Truck	0.00072	0.00034	150	0.219	0.108	0.051	0.067	0.032
Alternate									
	Rail	0.00072	0.00034	250	1.095	0.180	0.085	0.337	0.160
	Truck	0.00072	0.00034	150	0.329	0.108	0.051	0.101	0.048

11. PM/PM$_{10}$ from Gypsum Storage Pile

Emissions from the gypsum storage pile are calculated using the same methodology used for the truck and railcar unloading operations. This calculation method is used both for dumping onto the pile from the transport truck and for the reclaim operation utilizing a front end loader. For gypsum, the moisture content is assumed to be 10 percent, based on typical specification for this material. The wind speed is assumed to be equal to 12.26 miles per hour. The PM$_{10}$ emission factor for these operations is calculated as follows:

$$E_{PM10,\,drop} = 0.35 \times 0.00032 \times \frac{\left(\frac{12.26}{5}\right)^{1.3}}{\left(\frac{10}{2}\right)^{1.4}} = 0.000378 \,\frac{lb}{ton}$$

The maximum rates of material transfer are 100 tons per hour for the transport truck dumping operation and 250 tons per hour for the reclaim operation. Table III-6 shows the operating limitations and the maximum hourly and annual PM and PM$_{10}$ emission rates for these operations.

Table III-6. PM/PM$_{10}$ Emissions from Gypsum Storage Pile

Activity	Emission Factor (lb/ton)		Operating Rate		Emissions			
			tons/hr	10^6 tons/yr	Lbs/hr		Tons/yr	
	PM	PM$_{10}$			PM	PM$_{10}$	PM	PM$_{10}$
Dumping	0.00080	0.00038	100	0.125	0.080	0.038	0.050	0.024
Reclaim	0.00080	0.00038	250	0.312	0.201	0.094	0.125	0.059

12. NO$_X$, CO, and SO$_2$ from Limestone Blasting

Emissions of gaseous pollutants from limestone blasting occur due to detonation of the ammonium nitrate-fuel oil mixture. These emissions are calculated using the emission factors presented in Section 13.3 of EPA's AP-42 emission factor compilation. Table III-7 shows the operating limitations and the maximum annual emission rates for this operation.

Table III-7. Emissions from Explosive Detonation in Limestone Blasting

Blasts/yr	Tons/blast	Emission Factor (lb/ton)			Emissions (tons/yr)		
		NO$_X$	CO	SO$_2$	NO$_X$	CO	SO$_2$
48	5.26	17	67	2	2.15	8.46	0.3

Annual NO_X emissions are calculated as follows:

$$PTE_{NO_X} = 48\frac{\text{blasts}}{\text{yr}} \times 5.26\frac{\text{tons}}{\text{blast}} \times 17\frac{\text{lb}}{\text{ton}} \div 2000\frac{\text{lbs}}{\text{ton}} = 2.15\frac{\text{tons}}{\text{yr}}$$

13. PM/PM_{10} from Limestone Blasting

Emissions of particulate matter from limestone blasting occur due to shattering of the rock. These emissions are calculated using the calculation methodology presented in Section 11.9 of EPA's AP-42 emission factor compilation. Specifically, the following equations are used to calculate PM and PM_{10} emission factors in units of lbs per blast:

$$E_{PM} = 0.000014 \times A^{1.5}$$
$$E_{PM_{10}} = 0.52 \times E_{PM}$$

Where A = horizontal blast area, ft^2

The horizontal area of each blast is 8,600 ft^2, so the PM and PM_{10} emission factors are 11 lb/blast and 5.8 lb/blast, respectively. Table III-8 shows the operating limitations and the maximum annual emission rates for this operation.

Table III-8. PM/PM_{10} Emissions from Limestone Blasting

Blasts/yr	Emission Factor (lb/blast)		Emissions (tons/yr)	
	PM	PM_{10}	PM	PM_{10}
48	11	5.8	0.27	0.14

Annual PM_{10} emissions are calculated as follows:

$$PTE_{PM_{10}} = 48\frac{\text{blasts}}{\text{yr}} \times 11\frac{\text{lb}}{\text{blast}} \div 2000\frac{\text{lbs}}{\text{ton}} = 0.27\frac{\text{tons}}{\text{yr}}$$

14. PM/PM_{10} from Other Quarry Operations

Emissions from limestone drilling, from loading of limestone into trucks using a payloader, and from unloading of limestone from trucks into the hopper of the primary crusher are calculated using the emission factors presented in Section 11.19.2 of EPA's AP-42 emission factor compilation.

The maximum rates of material transfer are 250 tons per hour for the railcar unloading operation and 150 tons per hour for the truck unloading operation. As described in Section V.E herein, the Permittee is required to use water sprays to meet BACT requirements for these unloading operations. This control measure is estimated to reduce PM and PM_{10} emissions by 75 percent. Hourly controlled PM_{10} emissions from the railcar unloading operation are calculated as follows:

$$PM_{10_{rail}} = 0.00136 \frac{lb}{ton} \times 250 \frac{tons}{hr} \times \left(1 - \frac{75}{100}\right) = 0.085 \frac{lb}{hr}$$

The maximum rates of material transfer at the railcar and truck unloading hoppers are limited by enforceable permit terms. Table III-9 shows the operating limitations and the maximum hourly and annual PM and PM_{10} emission rates for these operations under each scenario.

Table III-9. PM/PM_{10} Emissions from Other Quarry Operations

Operation	Emission Factor ($lb/10^3$ tons)		Operating Rate (10^3 tons/yr)	Control Efficiency	Emissions (tons/yr)			
					Uncontrolled		Controlled	
	PM	PM_{10}			PM	PM_{10}	PM	PM_{10}
Wet Drilling	0.168	0.080	1,056	0	0.089	0.042	n/a	n/a
Truck Loading	0.0336	0.016	1,544	0	0.026	0.012	n/a	n/a
Truck Unloading	0.0336	0.016	1,544	75%	0.026	0.012	0.006	0.003

IV. APPLICABLE REQUIREMENTS

The Permittee has identified all applicable regulations that apply to each unit identified in the permit application. Sections IV.A through IV.G of this document present a detailed explanation of the rationale for applicability and non-applicability for certain regulations.

A. Permit Regulations

1. Class I Permit

a. Applicability

The potentially applicable air quality permit regulations are the State of Arizona regulations at Title 18, Chapter 2, Articles 3 and 4.

b. Permit Application Processing

Pursuant to Arizona Administrative Code (A.A.C.) R18-2-302.A and -302.B, a Class I permit is required prior to construction or operation of a major source. The proposed Drake Cement facility has the potential to emit more than 25 tons per year of hazardous air pollutants and, therefore, would be a major source under Section 112 of the Clean Air Act. (See A.A.C. R18-2-101.64.b.i.) The proposed facility also has the potential to emit more than 100 tons per year of several regulated air pollutants and is in a listed source category and, therefore, is a major stationary source under Section 302 of the Clean Air Act. (See A.A.C. R18-2-101.64.c.)

2. Nonattainment New Source Review

The site of the proposed Drake Cement facility is in an area that is attainment or is unclassifiable for all pollutants. (In other words, the area is not a nonattainment area for any pollutant.) Therefore, the proposed facility is not a major source pursuant to A.A.C. R18-2-401.9.a and is not subject to the provisions of A.A.C. R18-2-403 through 405.

3. Prevention of Significant Deterioration

a. Applicability

The proposed Drake Cement facility has the potential to emit more than 100 tons per year of several air pollutants and is a categorical source pursuant to A.A.C. R18-2-401.2. The site of the proposed facility is in an area that is attainment or is unclassifiable for all pollutants. (In other words, the area is not a nonattainment area for any pollutant.) Therefore, the proposed facility is a major source pursuant to A.A.C. R18-2-401.9.b and is subject to the provisions of R18-2-406. The pollutants for which the proposed facility's potential to emit is significant are carbon monoxide, nitrogen oxides, particulate matter, PM_{10}, and $PM_{2.5}$.

b. Best Available Control Technology

Pursuant to A.A.C. R18-2-406.A, the proposed Drake Cement facility is required to apply Best Available Control Technology (BACT) for each pollutant for which the potential to emit is significant. The determination of BACT is discussed in detail in Section V herein.

c. Air Quality Impact Analysis and Monitoring Requirements

Pursuant to A.A.C. R18-2-407, the Permittee is required to perform an analysis of the air quality impacts of the proposed facility. The air quality impact analysis is discussed in detail in Section VII herein.

d. Visibility Impact Analysis

Pursuant to A.A.C. R18-2-410, the Permittee is required to perform an analysis of the visibility impacts of the proposed facility. The visibility impact analysis is discussed in detail in Section VII herein.

B. New Source Performance Standards (NSPS)

The NSPS regulations apply to listed types of emission units and process units (i.e., "affected facilities") for which construction, reconstruction, or modification is commenced after a particular date, specific to that unit or source type. Several of these NSPS regulations are applicable to one or more emission units and process units at the proposed cement plant.

1. 40 CFR § 60 Subpart A, General Provisions

The provisions of Subpart A apply to each affected facility, as specified in the relevant NSPS regulation for that source type. Subpart A contains general requirements for notifications, monitoring, performance testing, reporting, recordkeeping, and operation and maintenance provisions.

Subpart A of 40 CFR Part 60 is adopted by reference at A.A.C. R18-2-901.1.

2. 40 CFR § 60 Subpart F, Standards of Performance for Portland Cement Plants

No provisions of this regulation are applicable to the Drake Cement facility pursuant to the exemption provided at 40 CFR § 63.1356(a).

3. 40 CFR § 60 Subpart Y, Standards of Performance for Coal Preparation Plants

The provisions of this regulation are applicable to the coal mill at the Drake Cement facility. Other coal handling equipment at the facility is exempt from the provisions of this regulation pursuant to 40 CFR § 63.1356(b). The applicable provisions of Subpart Y are included in Section I of Attachment "B" of the proposed permit.

Subpart Y of 40 CFR Part 60 is adopted by reference at A.A.C. R18-2-901.32.

4. 40 CFR § 60 Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants

The provisions of this regulation are applicable to the Limestone Processing Plant at the Drake Cement facility. The affected equipment includes the limestone crusher at the quarry, the overland belt conveyors between the quarry and the Portland cement plant, and the storage building in which crushed limestone is stored at the Portland cement plant. The applicable provisions of Subpart OOO are included in Section III of Attachment "B" of the proposed permit.

Subpart OOO of 40 CFR Part 60 is adopted by reference at A.A.C. R18-2-901.66.

C. National Emission Standards for Hazardous Air Pollutants (NESHAP)

1. 40 CFR § 63 Subpart A, General Provisions

The provisions of Subpart A apply to each affected facility, as specified in the relevant NESHAP regulation for that source type. Subpart A contains general requirements for notifications, monitoring, performance testing, reporting, recordkeeping, and operation and maintenance provisions.

Subpart A of 40 CFR Part 63 is adopted by reference at A.A.C. R18-2-1101(B)(1).

2. 40 CFR § 63 Subpart B, Control Technology Determinations for Major Sources in Accordance with Clean Air Act §§ 112(g) and 112(j)

Most of the regulations in 40 CFR Part 63, including Subparts LLL and ZZZZ discussed below, are source category-specific NESHAP regulations implementing Clean Air Act § 112(d). Each of these source category-specific NESHAP includes the U.S. EPA's determination of the Maximum Achievable Control Technology (MACT) for the specified source category.

For emission units that are located at major sources of HAPs and that are not subject to a source category-specific NESHAP, Clean Air Act §§ 112(g) and 112(j) generally require case-by-case determinations of MACT. These requirements are implemented through the provisions of Subpart B of 40 CFR part 63. Subpart B is adopted by reference at A.A.C. R18-2-1101(B)(2).

There are two separate and distinct sets of requirements in Subpart B. The first, at §§ 63.40 through 63.44, implements § 112(g) of the Clean Air Act. Case-by-case MACT determinations pursuant to §§ 63.40 through 63.44 are required by A.A.C. R18-2-302.D. These provisions apply to construction or reconstruction of major sources of HAPs at which there are HAP-emitting units that have neither been regulated nor exempted from regulation under a source category-specific NESHAP.

For the proposed Drake Cement facility, all HAP-emitting units are exempt from the provisions of §§ 63.40 through 63.44 because they either are regulated or are specifically exempted from regulation under a source category-specific NESHAP.

The second set of provisions, at §§ 63.50 through 63.56 of Subpart B, implements § 112(j) of the Clean Air Act. These provisions apply to major sources of HAPs in source categories for which the U.S. EPA has failed to promulgate a source category-specific NESHAP within 18 months after the scheduled promulgation date for that regulation. These provisions are not applicable to any emissions units at the proposed facility.

3. 40 CFR § 63 Subpart LLL, Portland Cement Manufacturing Industry

The provisions of Subpart LLL apply to many of the emission units at the proposed Drake Cement facility. The applicable requirements of Subpart LLL are included in Sections I and II of Attachment "B" of the proposed permit.

Subpart LLL of 40 CFR Part 63 is adopted by reference at A.A.C. R18-2-1101(B)(49).

4. 40 CFR § 63 Subpart ZZZZ, Stationary Reciprocating Internal Combustion Engines

The proposed cement plant will include one stationary, reciprocating internal combustion engine used to drive an emergency electrical generator and two fire water pumps. Each of these engines meets the criteria to be classified as an emergency stationary reciprocating internal combustion engine under Subpart ZZZZ. As such, each engine is exempt from all substantive requirements of the regulation.

D. Arizona Administrative Code

1. A.A.C. R18-2-602, Open Burning

A.A.C. R18-2-602 prohibits open outdoor fires except under certain, specified conditions. The provisions of this regulation are included in Section VII of the proposed permit.

2. A.A.C. R18-2-604, Open Areas, Dry Washes, or Riverbeds

A.A.C. R18-2-604 restricts fugitive dust emissions from open areas including, but not limited to, driveways, parking areas, vacant lots, dry washes, and riverbeds. The provisions of this regulation are included in Section VII of the proposed permit.

3. A.A.C. R18-2-605, Roadways and Streets

A.A.C. R18-2-605 restricts fugitive dust emissions from roadways and alleys, including the transportation of materials over those roadways or alleys. The provisions of this regulation are included in Section VI of the proposed permit.

4. A.A.C. R18-2-606, Material Handling

A.A.C. R18-2-606 restricts fugitive dust emissions from nonpoint sources associated with operations such as material crushing, screening, handling, transporting, or conveying. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit. The provisions of this regulation are not applicable to any of the material handling operations identified in Sections II through IV of Attachment "B" of the proposed permit because each of these operations has an identifiable emission point.

5. A.A.C. R18-2-607, Storage Piles

A.A.C. R18-2-607 restricts fugitive dust emissions from material stacking, piling, or similar storage methods. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit. The provisions of this regulation are not applicable to any of the storage piles identified in Sections III and IV of Attachment "B" of the proposed permit because each of these storage piles has an identifiable emission point.

6. A.A.C. R18-2-612, Opacity of Emissions from Nonpoint Sources

A.A.C. R18-2-612 restricts opacity of visible emissions from nonpoint sources. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

7. A.A.C. R18-2-702, General Provisions for Existing Point Sources

A.A.C. R18-2-702 restricts opacity of visible emissions from existing point sources not covered by other opacity standards for existing point source. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit. The emission units covered by Sections I through III of Attachment "B" of the proposed permit are not regulated by A.A.C. R18-2-702 because they are covered by applicable new source performance standards at Title 18, Chapter 2, Article 9 of the State of Arizona regulations. These emission units are not "existing sources" as that term is defined at A.A.C. R18-2-101(41). The emergency generator internal combustion engine is not regulated by A.A.C. R18-2-702 because it is subject to an opacity limitation under A.A.C. R18-2-719.

8. A.A.C. R18-2-703, Steam Generators and Fuel-Burning Equipment

A.A.C. R18-2-703 includes particulate matter and SO_2 emission standards for steam generating units and other fuel-burning equipment having a heat input capacity of 250 million Btu per hour or more. The proposed Drake Cement facility will not include any such units.

9. A.A.C. R18-2-705, Portland Cement Plants

A.A.C. R18-2-705 limits particulate matter emissions, SO_2 emissions, and opacity of visible emissions from Portland cement plants. This regulation is not applicable to any emission unit at the proposed Drake Cement facility. The kiln, clinker cooler, raw mill system, finish mill system, raw mill dryer, raw material storage facilities, clinker storage facilities, finished product storage facilities, conveyor transfer points, bulk loading systems, and bulk unloading systems are not regulated by A.A.C. R18-2-705 because they are covered by applicable new source performance standards at Title 18, Chapter 2, Articles 9and 11 of the

State of Arizona regulations. Thus, these units are not "existing sources" as that term is defined at A.A.C. R18-2-101(41).

10. A.A.C. R18-2-710, Petroleum Liquid Storage Vessels

A.A.C. R18-2-710 includes emission standards for petroleum liquid storage tanks with storage capacity of 40,000 gallons or more. The proposed Drake Cement facility will not include any such tanks.

11. A.A.C. R18-2-716, Coal Preparation Plants

A.A.C. R18-2-716 includes emission standards for coal preparation plants. The coal preparation plant at the proposed Drake Cement facility is not regulated by A.A.C. R18-2-716 because it is covered by applicable new source performance standards at Title 18, Chapter 2, Article 9 of the State of Arizona regulations. Thus, this facility is not an "existing source" as that term is defined at A.A.C. R18-2-101(41).

12. A.A.C. R18-2-719, Stationary Rotating Machinery

A.A.C. R18-2-719 limits visible emissions and emissions of PM and SO_2 from internal combustion engines. The visible emissions limitation is included in Section V of Attachment "B" of the proposed permit. The PM and SO_2 emission limits are less stringent than the applicable BACT emission limits under all operating conditions and, for this reason, have been streamlined out of the proposed permit.

13. A.A.C. R18-2-722, Gravel or Crushed Stone Processing Plants

A.A.C. R18-2-722 includes emission standards for crushed stone processing plants. The limestone processing plant at the proposed Drake Cement facility is not regulated by A.A.C. R18-2-722 because it is covered by applicable new source performance standards at Title 18, Chapter 2, Article 9 of the State of Arizona regulations. Thus, this facility is not an "existing source" as that term is defined at A.A.C. R18-2-101(41).

14. A.A.C. R18-2-724, Fossil-fuel Fired Equipment

A.A.C. R18-2-724 includes particulate matter and SO_2 emission standards for steam generating units and other fuel-burning equipment. This regulation is not applicable to any emission unit at the proposed Drake Cement facility. The rotary kiln is not covered because the products of combustion come into direct contact with the process materials in the kiln.

15. A.A.C. R18-2-726, Sandblasting Operations

A.A.C. R18-2-726 restricts fugitive dust emissions from abrasive blasting operations. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

16. A.A.C. R18-2-727, Spray Painting Operations

A.A.C. R18-2-727 restricts VOC emissions from spray painting operations. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

17. A.A.C. R18-2-730, Unclassified Sources

A.A.C. R18-2-730 restricts emissions of particulate matter, SO_2, and NO_X from sources not otherwise regulated under Articles 7, 9, or 11; and prohibits the causation of air pollution. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

18. A.A.C. R18-2-801, General Provisions for Mobile Sources

A.A.C. R18-2-801 restricts opacity of visible emissions from mobile sources not otherwise regulated under Article 8. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

19. A.A.C. R18-2-802, Off-Road Machinery

A.A.C. R18-2-802 restricts opacity of visible emissions from trucks, graders, scrapers, rollers, locomotives, and other machinery not normally driven on completed public roadways. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

20. A.A.C. R18-2-804, Roadway and Site-Cleaning Machinery

A.A.C. R18-2-804 restricts opacity of visible emissions from roadway and site cleaning machinery, including the exhaust from such machinery. The provisions of this regulation are included in Section VII of Attachment "B" of the proposed permit.

21. Article 9, New Source Performance Standards

A.A.C. R18-2-901 incorporates by reference those federal NSPS regulations for which the Department has been delegated enforcement authority by the U.S. EPA. Applicable and non-applicable NSPS regulations are discussed in Section IV.B herein.

22. Article 11, Federal Hazardous Air Pollutants

A.A.C. R18-2-1101 incorporates by reference those federal NESHAP regulations for which the Department has been delegated enforcement authority by the U.S. EPA. Applicable and non-applicable NESHAP regulations are discussed in Section IV.C herein.

E. Compliance Assurance Monitoring

The Compliance Assurance Monitoring (CAM) rule is codified at 40 CFR Part 64, and the CAM monitoring requirements are mandatory elements of the Class I permit pursuant to A.A.C. R18-2-306(A)(3)(a)(i). Generally, the rule applies wherever the following three criteria are met:

- The emission unit is subject to an emission limitation or standard for a particular pollutant;
- The emission unit uses a control device to achieve compliance with the emission limitation or standard; and
- The emission unit has potential, pre-control device emissions greater than the applicable major source threshold.

The proposed Drake Cement facility will include three pollutant-specific emission units meeting these criteria:

- NO_X emissions from the Rotary Kiln;
- PM_{10} emissions from the Rotary Kiln and Raw Mill; and
- PM_{10} emissions from the Clinker Grate Cooler.

However, pursuant to 40 CFR § 64.2(b)(1)(vi), the provisions of the CAM rule do not apply where the applicable emission limitation or standard is one "for which a Part 70 or 71 permit specifies a continuous compliance determination method." This term is defined at 40 CFR § 64.1 as follows:

> "... a method, specified by the applicable standard or an applicable permit condition, which: (1) Is used to determine compliance with an emission limitation or standard on a continuous basis, consistent with the averaging period established for the emission limitation or standard; and (2) Provides data either in units of the standard or correlated directly with the compliance limit."

The kiln qualifies for this exemption with respect to its NO_X emissions. A NO_X continuous emission monitoring system (CEMS) is required to be installed and operated on the Main Stack in order to determine compliance with the NO_X emission limits applicable to the kiln.

For the remaining two pollutant-specific emission units, the provisions of the CAM rule apply. The rule allows for two general approaches: continuous monitoring to determine compliance directly, such as using CEMS, or monitoring of control device operation within specified ranges of performance to provide reasonable assurance of compliance. The latter approach will be used for both of the CAM-affected pollutant-specific emission units at the proposed Drake Cement facility. The applicable CAM rule provisions are incorporated into Section I of Attachment "B" of the proposed permit.

V. BEST AVAILABLE CONTROL TECHNOLOGY

A. General

1. Best Available Control Technology

As noted in Section IV.A.3 herein, PSD regulations under Title I of the Federal Clean Air Act and A.A.C. R18-2-406(A) are applicable to the proposed Drake Cement facility. One of the substantive requirements under the PSD regulations is that, for a new major stationary source, the Best Available Control Technology, or "BACT," must be applied to each emission unit. This requirement applies on a pollutant-specific basis. The proposed facility is subject to the PSD provisions for four pollutants: PM, PM_{10}, NO_X, and CO.

The term "best available control technology" is defined at A.A.C. R18-2-101(19) as follows:

> *"[A]n emission limitation, including a visible emissions standard, based on the maximum degree of reduction for each air pollutant listed in R18-2-101(97)(a) which would be emitted from any proposed major source or major modification, taking into account energy, environmental, and economic impact and other costs, determined by the Director in accordance with R18-2-406(A)(4) to be achievable for such source or modification."*

The procedures for establishing BACT are set forth at A.A.C. R18-2-406(A)(4) as follows:

> *"BACT shall be determined on a case-by-case basis and may constitute application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment, clean fuels, or innovative fuel combustion techniques, for control of such pollutant. In no event shall such application of BACT result in emissions of any pollutant, which would exceed the emissions allowed by any applicable new source performance standard or national emission standard for hazardous air pollutants under Articles 9 and 11 of this Chapter. If the Director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof may be prescribed instead to satisfy the*

requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results."

The U.S. EPA's interpretive policies relating to BACT analyses are set forth in several informal guidance documents. Most notable among these are the following:

- "Guidelines for Determining Best Available Control Technology (BACT)," December 1978.
- "Prevention of Significant Deterioration Workshop Manual," October 1980.
- "New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting." Draft. October 1990.

The Department generally uses what is termed a "top-down" procedure when making BACT determinations. This procedure is designed to ensure that each determination is made consistent with the two core criteria for BACT: consideration of the most stringent control technologies available, and a reasoned justification, considering energy, environmental and economic impacts and other costs, of any decision to require less than the maximum degree of reduction in emissions.

The framework for the top-down BACT analysis procedure used by the Department comprises five key steps, as discussed in detail below. The five-step procedure mirrors the analytical framework set forth in the draft 1990 guidance document. However, it should be noted that the Department does not necessarily adhere to the prescriptive process described in the draft 1990 guidance document. Strict adherence to the detailed top-down BACT analysis process described in that draft document would unnecessarily restrict the Department's judgment and discretion in weighing various factors before making case-by-case BACT determinations. Rather, as outlined in the 1978 and 1980 guidance documents, the Department has broad flexibility in applying its judgment and discretion in making these determinations.

Step 1 - Identify all control options. The process is performed on a source-by-source and pollutant-by-pollutant basis and begins with the identification of available control technologies and techniques. For BACT purposes, "available" control options are those technologies and techniques, or combinations of technologies and techniques, with a practical potential for application to the subject emission units and pollutants. These may include fuel cleaning or treatment, inherently lower-polluting processes, and end-of-pipe control devices. All identified control options are listed in this step. Those that are identified as being technically infeasible or as having unreasonable energy, economic or environmental impacts or other unacceptable costs are eliminated in subsequent steps.

Step 2 - Eliminate technically infeasible control options. In this step, the technical feasibility of identified control options is evaluated with respect to source-specific factors. Technically feasible control options are those that have been demonstrated to function efficiently on identical or similar processes. In general, if a control option has been demonstrated to function efficiently on the same type of emission unit, or another unit with similar exhaust streams, the control option is presumed to be technically feasible. For presumably technically feasible control options, demonstrations of technical infeasibility must show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the control option from being employed successfully on the subject emission unit. Technical feasibility need not be addressed for control options that are less effective than the control option proposed as BACT by the permit applicant.

Step 3 - Characterize control effectiveness of technically feasible control options. For each control option that is not eliminated in Step 2, the overall control effectiveness for the pollutant under review is characterized. The control option with the highest overall effectiveness is the "top" control option. If the top control option is proposed by the permit applicant as BACT, no evaluation is required under Step 4, and the procedure moves to Step 5. Otherwise, the top control option and other identified control options that are more effective than that proposed by the permit applicant must be evaluated in Step 4. A control option that can be designed and operated at two or more levels of control effectiveness may be presented and evaluated as two or more distinct control options (i.e., an option for each control effectiveness level).

Step 4 - Evaluate more effective control options. If any identified and technically feasible control options are more effective than that proposed by the permit applicant as BACT, rejection of those more effective control options must be justified based on the evaluation conducted in this step. For each control option that is more effective than the option ultimately selected as BACT, the rationale for rejection must be documented for the public record. Energy, environmental, and economic impacts and other costs of the more effective control options, including both beneficial and adverse (i.e., positive and negative) impacts, are listed and considered.

Step 5 - Establish BACT. Finally, the most effective control technology not rejected in Step 4 is proposed as BACT. To complete the BACT process, an enforceable emission limit representing BACT must be included in the PSD permit. This emission limit must be enforceable as a practical matter. In order for the emission limit to be enforceable as a practical matter, in the case of a numerical emission limitation, the permit must specify a reasonable compliance averaging time, consistent with established reference methods. The permit must also include compliance verification procedures (i.e., monitoring requirements) designed to show compliance or non-compliance on a time period consistent with the applicable emission limit.

Materials considered by the applicant and by the Department in identifying and evaluating available control options include the following:

- Entries in the RACT/BACT/LAER Clearinghouse (RBLC) maintained by the U.S. EPA. This database is the most comprehensive and up-to-date listing of control technology determinations available.
- Information provided by pollution control equipment vendors.
- Information provided by industry representatives and by other State permitting authorities. This information is particularly valuable in clarifying or updating control technology information that has not yet been entered into the RACT/BACT/LAER Clearinghouse.

The BACT evaluations and proposed BACT determinations for each category of emission unit at the proposed Drake Cement facility are discussed in the following subsections.

2. Maximum Achievable Control Technology

As noted in Section IV.C.2 herein, case-by-case MACT regulations under 40 CFR Part 63, Subpart B required by A.A.C. R18-2-302(D) and incorporated by reference at A.A.C. R18-2-1101(B)(2) are not applicable to any emission sources at the proposed Drake Cement facility.

B. BACT for Pyroprocessing System

1. BACT for PM/PM_{10} Emissions

<u>Steps 1-4</u>

Control options for particulate matter emissions from the Rotary Kiln, Raw Mill, and Coal Mill include venturi scrubbers, electrostatic precipitators, and fabric filter baghouses. All of these control options are technically feasible. The most effective control option is the use of fabric filter baghouses. No significant, adverse environmental or energy impacts are associated with any of these control options.

Step 5

The Permittee has proposed to use two fabric filter baghouses to achieve compliance with a PM_{10} BACT emission limit of 0.010 gr/dscf for the Rotary Kiln, Raw Mill, and Coal Mill. The Department is not aware of any Portland cement pyroprocessing system that is subject to more stringent requirements, and the Department concurs that this emission limitation represents BACT for PM and PM_{10} emissions from these emissions units.

2. BACT for NO_X Emissions

Steps 1-4

Control options for NO_X emissions from the Rotary Kiln include process modifications, combustion modifications, selective catalytic reduction, and selective non-catalytic reduction. Selective catalytic reduction has not been demonstrated to function efficiently on Portland cement kiln exhaust gases. There are significant and unresolved technical concerns with application of this technology due to exhaust gas temperature variability and catalyst fouling. Therefore, selective catalytic reduction is not considered by the Department to be technically feasible.

Each of the remaining control options is technically feasible. These control technologies and techniques can be applied in combination to form the most effective control strategy. No significant, adverse environmental or energy impacts are associated with this control strategy.

Step 5

The Permittee has proposed to use process modifications, combustion modifications, and selective non-catalytic reduction to achieve compliance with NO_X BACT emission limits of 2.45 lbs per ton of clinker produced for the first 180 days of operation and 1.95 lbs per ton of clinker produced thereafter. Each of these limits is based on a daily rolling 30-day average. The Department is not aware of any Portland cement pyroprocessing system that is subject to more stringent requirements, and the Department concurs that these emission limitations represent BACT for NO_X emissions from the Rotary Kiln.

3. BACT for CO Emissions

Step 1

Control options for CO emissions from the Rotary Kiln, Raw Mill, and Coal Mill include good combustion practices, catalytic oxidation, thermal oxidation, operation without advanced multi-stage combustion for NO_X control, and operation without selective non-catalytic reduction for NO_X control.

Step 2

Catalytic oxidation has not been demonstrated to function efficiently on Portland cement kiln exhaust gases. There are significant and unresolved technical concerns with application of this technology due to exhaust gas temperature variability and catalyst fouling. Therefore, catalytic oxidation is not considered by the Department to be technically feasible.

Each of the remaining control options is technically feasible.

Step 3

The technically feasible control technologies and techniques can all be applied in combination to form the most effective control strategy. The Department is not aware of any facility operating with thermal oxidation and without advanced multi-stage combustion or selective non-catalytic reduction for NO_X control, so the emission limitation achievable with this equipment configuration is somewhat uncertain. For the purposes of this analysis, it is assumed that the achievable CO emission level with this control strategy is 0.2 lb per ton of clinker. This represents an 80 percent reduction relative to the fourth most effective control strategy, which represents the same equipment configuration minus the thermal oxidizer.

The second most effective control strategy involves operation with good combustion practices and thermal oxidation. The achievable CO emission level with this control strategy, based on the emission limitation in the initial construction permit for the similarly configured TXI Midlothian facility in Texas, is 0.37 lb per ton of clinker.

The third most effective control strategy involves operation with good combustion practices and thermal oxidation. The Department is not aware of any facility operating with advanced multi-stage combustion, selective non-catalytic reduction, and thermal oxidation, so the emission limitations achievable with this equipment configuration are somewhat uncertain. For the purposes of this analysis, it is assumed that the achievable CO emission level with this control strategy is 0.72 lb per ton of clinker.

The fourth most effective control strategy involves good combustion practices and operation without an advanced multi-stage combustion system or selective non-catalytic reduction. For the purposes of this analysis, it is assumed that the achievable CO emission level with this control strategy is 1.0 lb per ton of clinker.

The fifth most effective control strategy involves the same configuration represented in the second most effective control option, but with the thermal oxidizer operated at a more economical level. The achievable CO emission level with this control strategy, based on the emission limitation in the revised construction permit for the similarly configured TXI Midlothian facility in Texas, is 1.8 lb per ton of clinker.

The sixth most effective control strategy involves only good combustion practices in conjunction with selective non-catalytic reduction (i.e., not using the CO control technique "operation without SNCR"). The Department is not aware of any U.S. facility operating with selective non-catalytic reduction, so the emission limitations achievable with this equipment configuration are somewhat uncertain. For the purposes of this analysis, it is assumed that the achievable CO emission level with this control strategy is 3.6 lb per ton.

Step 4

The most effective control strategy would result in significant, adverse environmental, energy, and economic impacts. Of primary concern to the Department is the higher level of NO_X emissions that would be a necessary result of requiring the use of a thermal oxidizer for CO emissions and prohibiting the use of advanced multi-stage combustion or selective non-catalytic reduction for control of NO_X emissions. The Department estimates that the NO_X emissions level achievable with this configuration is 3.0 lbs per ton of clinker. This represents a NO_X emissions increase of 350 tons per year above the level represented by the NO_X BACT determination described previously.

The Department considers this to be an unacceptable adverse environmental impact that outweighs the beneficial environmental impacts of reduced CO and VOC emissions. Reducing the CO emissions from 3.6 lbs per ton of clinker, which is the sixth most effective control strategy and is the option proposed by the Permittee as BACT for CO emissions, to 0.20 lb per ton of clinker would yield an annual reduction in CO emissions of 1,120 tons per year. However, this emission reduction would represent negligible environmental benefit, as the predicted impact of the plant using the option proposed by the Permittee is less than two percent of the National Ambient Air Quality Standards for CO. In light of these factors, the Department considers the most effective control option for CO emissions to be less environmentally beneficial than the option proposed by the applicant. This option also is more costly in terms of economic impacts (due to the cost of the thermal oxidizer) and energy impacts (due to the fuel usage in the thermal oxidizer). For these reasons, the Department concludes that the most effective control option does not represent BACT for CO emissions.

The second most effective control strategy also would result in significant, adverse environmental, energy, and economic impacts. Of primary concern to the Department is the higher level of NO_X emissions that would be a necessary result of requiring the use of a thermal oxidizer for CO emissions and prohibiting the use of selective non-catalytic reduction for control of NO_X emissions. The Department estimates that the NO_X emissions level achievable with this configuration, based on the emission limitation imposed on the similarly configured TXI Midlothian facility in Texas, is 2.79 lbs per ton of clinker. This represents a NO_X emissions increase of 280 tons per year above the level represented by the NO_X BACT determination described previously.

The Department considers this to be an unacceptable adverse environmental impact that outweighs the beneficial environmental impacts of reduced CO and VOC emissions. Reducing the CO emissions from 3.6 lbs per ton of clinker, which is the sixth most effective control strategy and is the option proposed by the Permittee as BACT for CO emissions, to 0.37 lb per ton of clinker would yield an annual reduction in CO emissions of 1,070 tons per year. However, this emission reduction would represent negligible environmental benefit, as the predicted impact of the plant using the option proposed by the Permittee is less than two percent of the National Ambient Air Quality Standards for CO. In light of these factors, the Department considers this control strategy for CO emissions to be less environmentally beneficial than the strategy proposed by the applicant. This strategy also is more costly in terms of economic impacts (due to the cost of the thermal oxidizer) and energy impacts (due to the fuel usage in the thermal oxidizer). For these reasons, the Department concludes that the most effective control option does not represent BACT for CO emissions.

The third most effective control option would result in slight, adverse environmental impacts and significant, adverse energy and economic impacts. Of significant concern to the Department are the higher levels of PM_{10} and NO_X emissions that would be a necessary result of requiring the use of a thermal oxidizer for CO emissions. The Department estimates that the combined emissions of PM_{10} and NO_X would increase by at least 20 tons per year under this configuration. The Department considers these emissions increases to be significant, adverse environmental impacts that counteract the beneficial environmental impacts of reduced CO and VOC emissions.

The adverse economic and energy impacts of this control strategy include an estimated capital cost of $4 million, total annualized costs of approximately $2.7 million, increased energy usage of more than 200 billion Btu per year, and a cost effectiveness of approximately $2,700 per ton of CO emission reduction. The Department considers these to be unacceptable, adverse economic and energy impact. Considering these impacts in combination with the beneficial and adverse environmental impacts, the Department concludes that this control strategy does not represent BACT.

The fourth most effective control strategy, as the most effective control strategy, would require operation without an advanced multi-stage combustion system or selective non-catalytic reduction. For the reasons described previously, the Department considers this control strategy to be less environmentally beneficial than the control strategy proposed by the Permittee. Thus, notwithstanding the lower cost of this control strategy (due to removal of the selective non-catalytic reduction system) and the reduction in adverse energy impacts (due to removal of the selective non-catalytic reduction system and its electricity requirements), the Department concludes that this control strategy does not represent BACT for CO emissions.

The fifth most effective control strategy, as the second most effective control strategy, would require operation without selective non-catalytic reduction. For the reasons described previously, the Department considers this control strategy to be less environmentally beneficial than the control strategy proposed by the Permittee. In addition, this control strategy would result in significant, adverse energy and economic impacts as with the third most effective control strategy. For these reasons, the Department concludes that this control strategy does not represent BACT for CO emissions.

Step 5

The Permittee has proposed to use good combustion practices to achieve compliance with a CO BACT emission limit of 3.60 lbs per ton of clinker produced, based on a daily rolling 30-day average. The Department is not aware of any Portland cement pyroprocessing system that uses selective non-catalytic reduction for NO_X control and that is subject to more stringent requirements. The Department concurs that this emission limitation represents BACT for CO emissions from the Rotary Kiln.

C. *BACT for PM/PM_{10} Emissions from Clinker Cooler*

Steps 1-4

Control options for particulate matter emissions from the Clinker Cooler include venturi scrubbers, electrostatic precipitators, and fabric filter baghouses. All of these control options are technically feasible. The most effective control option is the use of fabric filter baghouses. No significant, adverse environmental or energy impacts are associated with any of these control options.

Step 5

The Permittee has proposed to use a fabric filter baghouse to achieve compliance with a PM_{10} BACT emission limit of 0.005 gr/dscf for the Clinker Cooler. The Department is not aware of any Portland cement clinker cooler system that is subject to more stringent requirements, and the Department concurs that this emission limitation represents BACT for PM and PM_{10} emissions from this emissions unit.

D. *BACT for PM/PM_{10} Emissions from Finish Mills and Conveying System Transfer Points*[1]

Steps 1-4

Control options for particulate matter emissions from the Finish Mills and

[1] It should be noted that the Drake Cement facility will include several storage piles for materials such as limestone, coal, and iron ore. These storage piles are listed in the proposed permit as affected sources and were included in the BACT analyses presented in the Permittee's air quality permit application. The configuration proposed by the Permittee involves completely enclosing these storage piles within buildings. In this configuration, the storage piles are not "emissions units" and are not included in the Department's BACT analysis. The conveying systems that are used to transfer material into the buildings containing the storage piles, and specifically the transfer points in these systems, are emissions units for which the Department has made BACT determinations.

Conveying System Transfer Points include unconfined operation in conjunction with water sprays and confined operation in conjunction with venturi scrubbers, electrostatic precipitators, or fabric filter dust collectors. All of these control options are technically feasible. The most effective control option is the use of confined (i.e., enclosed) operation with fabric filter dust collectors. No significant, adverse environmental or energy impacts are associated with either of these control options.

<u>Step 5</u>

The Permittee has proposed to employ confined operation in conjunction with fabric filter dust collectors to achieve compliance with a PM BACT emission limit of 0.008 gr/dscf for each Finish Mill and each Conveying System Transfer Point. The Department is not aware of any similar source that is subject to more stringent requirements, and the Department concurs that this emission limitation represents BACT for PM and PM_{10} emissions from each of these emissions units.

E. BACT for PM/PM_{10} Emissions from Truck and Railcar Unloading Operations

<u>Steps 1-3</u>

Control options for particulate matter emissions from the Truck and Railcar Unloading Operations include unconfined operation in conjunction with water sprays and confined operation in conjunction with venturi scrubbers, electrostatic precipitators, or fabric filter dust collectors. All of these control options are technically feasible. The most effective control options are those involving the use of confined (i.e., enclosed) operation in conjunction with an add-on control device.

<u>Step 4</u>

No significant, adverse environmental or energy impacts are associated with any of the identified control options. However, each of the control options involving confined (i.e., enclosed) operation would require the construction of buildings in which the unloading operations would occur. As the total uncontrolled PM_{10} emissions from these unloading operations are only about 2 tons per year, and the emissions using the control option proposed by the Permittee would be less than 1 ton per year, the Department has concluded that the cost of constructing buildings to house the unloading operations represent an unacceptable, adverse economic impact.

<u>Step 5</u>

The Permittee has proposed to use a partial enclosure, in conjunction with water sprays, in order to minimize emissions from the unloading operations. The Department concurs that the proposed work practice standard and design requirement are the emission limitations that represent BACT for PM and PM_{10} emissions from these emissions units.

F. BACT for PM/PM_{10} Emissions from Drilling, Blasting, and Quarry Truck Loading Operations

Steps 1-5

Control options for particulate matter emissions from the Drilling, Blasting, and Quarry Truck Loading Operations include unconfined operation in conjunction with water sprays and confined operation in conjunction with venturi scrubbers, electrostatic precipitators, or fabric filter dust collectors. None of these control options are technically feasible because the operation is mobile. BACT, therefore, is no control.

G. BACT for Paved Roads

Steps 1-4

Control options for particulate matter emissions from the Plant Roads include sweeping, vacuuming, watering, and minimizing vehicle speed. All of these control options are technically feasible. The most effective control option comprises vacuuming, watering, and minimizing vehicle speed. No significant, adverse environmental or energy impacts are associated with any of the identified control options.

Step 5

The Permittee has proposed to implement a program of vacuuming and watering the paved plant roads on days when the roads are not damp due to precipitation. The Permittee also has agreed to implement a vehicle speed limit of 20 miles per hour on paved plant roads. The Department is not aware of any similar source that is subject to more stringent requirements, and the Department concurs that the proposed work practice standards are the emission limitations that represent BACT for PM and PM_{10} emissions from these emissions units.

H. BACT for Unpaved Roads

Steps 1-3

Control options for particulate matter emissions from the Quarry Roads include watering and application of chemical stabilizers. Both of these control options are technically feasible. The more effective control option involves the application of chemical stabilizers.

Step 4

No significant, adverse environmental or energy impacts are associated with any of the identified control options. However, the control option requiring the application of chemical stabilizers would result in annual operating costs of more than $50,000. As the total uncontrolled PM_{10} emissions from unpaved roads are only about 20 tons per year, and the estimated emissions using the control option proposed by the Permittee would be only 8 tons per year per year, these costs represent an average cost effectiveness of nearly $4,000 per ton of PM_{10} emission reduction and an incremental cost effectiveness of nearly $20,000 per ton of PM_{10} emission reduction. The Department has concluded that this represents an unacceptable, adverse economic impact.

Step 5

The Permittee has proposed to implement a program of watering the unpaved quarry roads on days when the roads are not damp due to precipitation. The Permittee also has agreed to implement a vehicle speed limit of 15 miles per hour on unpaved quarry roads. The Department is not aware of any similar source that is subject to more stringent requirements, and the Department concurs that the proposed work practice standards are the emission limitations that represent BACT for PM and PM_{10} emissions from these emissions units.

I. BACT for Diesel-Fired Internal Combustion Engine

The proposed Drake Cement facility will include one reciprocating, compression-ignition internal combustion engine fired with Diesel fuel. This 282-horsepower engine will be used to drive an emergency electrical generator. The engine will be permitted to operate for a maximum of 312 hours per year.

The proposed compression-ignition internal combustion engine is generally similar to engines that are regulated as non-road mobile sources under 40 CFR Part 89. These non-road engine emission standards will not apply to the engines at the proposed facility because the engine will remain at the site for more than 12 months. Notwithstanding this difference in regulatory applicability, the air pollution control techniques for compression-ignition engines such as that at the proposed Drake Cement facility are generally driven by the emission standards for mobile sources. The mobile source emission regulations, unlike the BACT requirement for stationary sources, is technology-forcing; the current regulations establish emission standards that must be achieved by engines sold in the future and that are much more stringent than the standards that must be achieved today. For example, if the proposed facility were operating today (in 2005) and required the temporary use of a skid-mounted, 300-horsepower electrical generator, that engine would likely be compliant with the Tier 2 emission standards for non-road, compression-ignition engines. These emission standards apply to model year 2003 and later engines and include an emission limit of 4.9 grams total NO_X plus nonmethane hydrocarbon per brake horsepower-hour engine output. The Tier 3 emission standards, which apply to model year 2006 and later engines, include include an emission limit of 3.0 grams total NO_X plus nonmethane hydrocarbon per brake horsepower-hour engine output. This represents a 39 percent reduction in allowable emission levels, based on the expectations of U.S. EPA's Office of Mobile Sources with regard to the technological advancements that will be made by the engine manufacturing industry over a period of several years.

The Department cannot make its BACT determinations for the internal combustion engine at the proposed Drake Cement facility using the approach that U.S. EPA's Office of Mobile Sources uses, relying on expectations of future technological advancements, due to differences in the statutory requirements. However, the Department can and does rely on the continued research of U.S. EPA's Office of Mobile Sources with regard to recent technological advancements for control of emissions from non-road, compression-ignition engines.

1. BACT for Nitrogen Oxides

Step 1

Identified control technologies and techniques for NO_X emissions from compression-ignition engines include the following:

- Fuel injection rate shaping and multiple fuel injections, which typically utilize electronically-controlled fuel injection systems that vary the fuel injection rate and method according to engine load and other operating conditions. Lower NO_X emissions are achieved by initially limiting the rapid increase in temperature and pressure in the cylinder, postponing injection of most of the fuel until an established flame exists.
- Charge air cooling, which typically involves lowering the intake manifold temperature using an air-to-air heat exchanger, or aftercooler, located downstream of a turbocharger. Lower NO_X emissions are achieved by reducing the peak combustion temperature.
- Injection timing retard, also called ignition timing retard, which involves delaying the fuel injection point in each engine cycle such that the heat release from fuel combustion occurs during the cylinder expansion. Lower NO_X emissions are achieved by reducing the peak combustion temperature.

- Exhaust gas recirculation, which involves retaining or re-introducing a fraction of the exhaust gases. Lower NO_X emissions are achieved by reducing the peak combustion temperature and by reducing the amount of available molecular oxygen.
- Lean-NO_X catalyst technology, which typically involves the injection of Diesel fuel into the exhaust gas upstream of a zeolite catalyst. The catalyst adsorbs hydrocarbons from the reductant, creating a locally oxygen-poor region in which reduction of NO_X to N_2 and O_2 is promoted.
- NO_X adsorber technology, which typically utilize alkali or alkaline earth metal catalysts to adsorb NO_X on the catalyst surface under the fuel-lean and oxygen-rich conditions typical of Diesel engine exhaust. Periodically, the catalyst bed is subjected to fuel-rich exhaust in order to desorb the NO_X and regenerate the catalyst. The desorbed NO_X is catalytically reduced over a second catalyst, typically platinum and rhodium. The periodic regeneration step, which may occur as frequently as every 15 seconds or as infrequently as every several minutes during engine operation, comprises only a small fraction of total operating time. The fuel-rich exhaust conditions required for the regeneration step may be achieved by periodic changes in engine cycle operation, using fuel injection rate shaping systems as described above.
- Selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), and SCONOx, all of which are end-of-pipe air pollution control technologies.

<u>Step 2</u>

Lean-NO_X catalyst technology, NO_X adsorber technology, and SCONOx have not been demonstrated to function efficiently on stationary, compression-ignition engines or on sources with similar exhaust gas characteristics. Therefore, these technologies are not considered technically feasible options for controlling NO_X emissions from the emergency generator internal combustion engine.

<u>Step 3</u>

The second-ranked control option for NO_X emissions comprises the use of an internal combustion engine certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines, as codified at 40 CFR § 89.112. For the emergency generator engine, with a rated power output between 130 and 225 kilowatts, the relevant emission standards are known as the “Tier 3” standards and include a limit of 4.0 grams of combined NO_X plus nonmethane hydrocarbons per kilowatt-hour of output. The Department anticipates that the commercially available, compression-ignition engines certified to meet the cited non-road engine emission standards will utilize a combination of control technologies including electronically-controlled fuel injection rate systems for fuel injection shaping, multiple fuel injections, and injection timing retard; charge air cooling; and exhaust gas recirculation. This control option would result in estimated NO_X emissions of less than 0.4 tons per year from the emergency generator internal combustion engine, assuming negligible emissions of nonmethane hydrocarbons.

The highest-ranked control option for NO_X emissions involves the use of SCR in conjunction with the second-ranked control option. There are no available data characterizing the NO_X emission levels achievable with this equipment configuration. For the purposes of this BACT analysis, the Department has assumed that 80 percent reduction in NO_X emissions, down to a NO_X emission level of 0.1 ton per year, is achievable with SCR. This likely overstates the achievable NO_X emission reduction with SCR by a significant amount, as the engine will have very little time operating under the steady-state conditions favorable for SCR system performance. Nonetheless, the reasonableness of the Department's assumption regarding SCR efficiency is not material to the Department's preliminary BACT determination.

Step 4

The second-ranked control option will not cause any adverse energy, environmental, or economic impacts. The highest-ranked control option (i.e., the addition of SCR), when considered in comparison with the second-ranked control option, will cause adverse energy and economic impacts, and will yield both beneficial and adverse environmental impacts. The adverse energy impact is due to the electrical requirements of the SCR system operation and to the reduction in energy efficiency attributable to the pressure drop across the SCR catalyst grid. The adverse energy impacts are relatively minor and were not a significant factor in the BACT decision.

The adverse environmental impacts attributable to the addition of the SCR system include the use of ammonia reagent, with associated storage, shipping and handling risks; the handling and disposal of a spent catalyst as a solid waste stream; ammonia emissions; and, indirectly, formation of PM10 and visible plume from ammonia salt precipitates. It is assumed that the proposed Drake Cement would use aqueous ammonia as the active reagent in this SCR system, as opposed to the more hazardous anhydrous ammonia, so this is a relatively minor environmental impact and was not a significant factor in the BACT decision. Similarly, extensive industry experience with SCR systems indicates that the removal and disposal of spent SCR catalyst can be conducted safely, with insignificant risk to the environment. To the extent that the safe removal and disposal of spent catalyst results in an economic penalty, that cost is considered in the evaluation of adverse economic impacts discussed below. Otherwise, the environmental impacts of spent catalyst removal and disposal were not a significant factor in the BACT decision.

Ammonia "slip," or ammonia that is injected in the SCR system and exits the unit without participating in the chemical reduction of NO_X emissions, leads directly to emissions of ammonia and indirectly to the formation of visible plumes, secondary particulate matter, and visibility impairment. These problems are less severe when SCR catalyst is new and activity is highest, because the ammonia injection rate can be set to near-stoichiometric levels. As the catalyst ages, its activity decreases, and a higher ammonia reagent injection rate is required to maintain the rate of the NO_X reduction reaction necessary for continuous compliance with NO_X emission limits. This tends to result in increasing levels of ammonia slip.

The final consideration in the evaluation of alternative NO_X control options is the adverse economic impact associated with the application of SCR for the internal combustion engine. The Department estimates that the annualized cost of this control option would be in excess of \$5,000 and the cost effectiveness is at least \$20,000 per ton of NO_X emission reduction. The Department considers these to be significant, adverse economic impacts.

Considering these adverse economic impacts as well as the adverse environmental impacts and the relatively insignificant air quality benefits that would result, the Department concludes that requiring SCR for the internal combustion engine cannot be justified as BACT. Therefore, the Department considers BACT for NO_X emissions from the emergency generator internal combustion engine to be the use of engines certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines, as codified at 40 CFR § 89.112.

<u>Step 5</u>

The Department considers BACT for NO_X emissions from the emergency generator internal combustion engines to be the use of engines certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines, as codified at 40 CFR § 89.112. Due to the very low emissions from this engine, and due to the availability of engines that are certified to achieve this emission level, the Department has determined that an equipment design standard rather than an emission rate limit is appropriate. Compliance with the equipment design standard will be demonstrated using records of the engine manufacturer's emission performance guarantee.

2. BACT for Carbon Monoxide

Step 1

Identified control technologies and techniques for CO emissions include combustion modifications and post-combustion control devices (catalytic oxidation or NSCR).

Step 2

NSCR has not been demonstrated to function efficiently on lean-burn internal combustion engines. Therefore, NSCR is not considered a technically feasible option for controlling CO emissions from the emergency generator internal combustion engine at the proposed Drake Cement facility.

Step 3

The third-ranked control option for CO emissions comprises the use of internal combustion engines certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines, as codified at 40 CFR § 89.112. For the emergency generator engine, with a rated power output between 130 and 225 kilowatts, the relevant emission standards are known as the "Tier 3" standards and include a limit of 3.5 grams of CO per kilowatt-hour of output. The Department anticipates that the commercially available, compression-ignition engines certified to meet the cited non-road engine emission standards will utilize combustion modifications in order to meet these emission standards. This control option would result in total CO emissions of approximately 0.3 ton per year.

The second-ranked control option for CO emissions comprises the use of an internal combustion engine that is not certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines. Because these engines do not incorporate the NO_X-reducing control techniques described in Section V.I.2 herein, lower CO emissions are possible. Based on data provided in Table 3.4-1 in U.S. EPA's AP-42 emission factor compilation, CO emissions of 0.0055 lb/hp-hr are achievable with this control option. This control option would result in total CO emissions of approximately 0.2 ton per year.

The highest-ranked control option involves the use of catalytic oxidation in conjunction with the second-ranked control option. There are no available data characterizing the CO emission levels achievable with this equipment configuration. For the purposes of this BACT analysis, the Department has assumed that 90 percent reduction in CO emissions, down to a total CO emission level of 0.02 ton per year, is achievable with catalytic oxidation. This likely overstates the achievable CO emission reduction with oxidation catalyst by a significant amount, as the emergency generator engine will have very little time operating under the steady-state conditions favorable for oxidation catalyst system performance. Nonetheless, the reasonableness of the Department's assumption regarding oxidation catalyst system efficiency is not material to the Department's preliminary BACT determination.

<u>Step 4</u>

The third-ranked control option (i.e., combustion controls) will not cause any adverse energy, environmental, or economic impacts. The highest-ranked control option (i.e., the addition of catalytic oxidation), when considered in comparison with the second- or third-ranked control options, will cause adverse energy and economic impacts, and will yield both beneficial and adverse environmental impacts. The adverse energy impact is due to the reduction in energy efficiency attributable to the pressure drop across the oxidation catalyst grid. The adverse energy impacts are relatively minor and were not a significant factor in the BACT decision.

The adverse environmental impacts attributable to the addition of an oxidation catalyst system are due to the handling and disposal of spent catalyst as a solid waste stream. Extensive industry experience with oxidation catalyst systems indicates that the removal and disposal of spent catalyst can be conducted safely, with insignificant risk to the environment. To the extent that the safe removal and disposal of spent catalyst results in an economic penalty, that cost is considered in the evaluation of adverse economic impacts, discussed below. Otherwise, the environmental impacts of spent catalyst removal and disposal were not a significant factor in the BACT decision.

The final consideration in the evaluation of the highest-ranked CO control option is the adverse economic impact associated with the application of oxidation catalyst for the emergency generator internal combustion engine. The Department estimates that the annualized cost of this control option would be in excess of $5,000 and the cost effectiveness is at least $25,000 per ton of CO emission reduction. The Department considers these to be significant, adverse economic impacts.

Considering these adverse economic impacts as well as the adverse environmental impacts and the relatively insignificant air quality benefits that would result, the Department concludes that requiring an oxidation catalyst for the emergency generator internal combustion engine cannot be justified as BACT.

The second-ranked control option will not cause any adverse energy or economic impacts. However, when considered in comparison with the third-ranked control option, this option will cause adverse environmental impacts. Based on data provided in Table 3.4-1 in U.S. EPA's AP-42 emission factor compilation, NO_X emissions would increase to 0.013 lb/hp-hr under this control option. This represents an increase of approximately 0.3 tons of NO_X per year, in exchange for a CO emission reduction of less than 0.2 tons per year. The Department considers the adverse environmental impacts of this control option to outweigh the beneficial environmental impacts.

Therefore, the Department considers BACT for CO emissions from the emergency generator internal combustion engine to be the use of engines certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines, as codified at 40 CFR § 89.112.

Step 5

The Department considers BACT for CO emissions from the emergency generator internal combustion engine to be the use of an engine certified by the engine manufacturer to meet the emission standards for model year 2006 and later non-road, compression-ignition engines, as codified at 40 CFR § 89.112. Due to the very low emissions from this engine, and due to the availability of engines that are certified to achieve this emission level, the Department has determined that an equipment design standard rather than an emission rate limit is appropriate. Compliance with the equipment design standard will be demonstrated using records of the engine manufacturer's emission performance guarantee.

VI. MONITORING AND COMPLIANCE DEMONSTRATION PROCEDURES

This section of the Technical Support Document summarizes the requirements that are applicable to each of the emission units and emitting activities at the proposed refinery and describes the rationale of the Department in establishing case-by-case permit terms not discussed elsewhere.

A. Kiln, Raw Mill, and Coal Mill

All applicable requirements pertaining to the Rotary Kiln, Raw Mill, and Coal Mill are included in Section I of Attachment "B" of the draft permit.

The Rotary Kiln and Raw Mill are closely integrated and are considered to be a single emissions unit. The Coal Mill is somewhat integrated but is considered to be a separate emissions unit. The Rotary Kiln, Raw Mill, and Coal Mill will vent through a single stack (the "Main Stack"). The kiln and raw mill are subject to emission standards under 40 CFR § 63 Subpart LLL, as described in Section IV.C.3 herein, and the coal mill is subject to emission standards under 40 CFR § 60 Subpart Y, as described in Section IV.B.3 herein. In addition, these units collectively are subject to emission limits representing BACT, as described in Section V.B herein; to emission limits used to restrict potential to emit for the purposes of avoiding PSD applicability for VOC and SO_2 emissions; to emission limits representing maximum actual emissions for dispersion modeling purposes; and to an ammonia emission limit voluntarily proposed by the applicant in order to alleviate concerns raised by the Federal Land Manager as described in Section VII.K.4 herein.

All applicable testing, monitoring, recordkeeping, and reporting requirements under 40 CFR § 60 Subpart Y and 40 CFR § 63 Subpart LLL are included in the draft permit. In addition, where these applicable requirements are not sufficient to assure compliance with the case-by-case emission limitations, the permit includes additional monitoring and reporting requirements. As a result, the Main Stack will be equipped with a COMS; CERMS for SO_2, NO_X, CO, THC, and ammonia; and both of the baghouses venting into this stack will be equipped with monitoring systems for temperature and pressure drop.

The monitoring requirements for the PM_{10} emission limits affecting the kiln and raw mill are subject to CAM rule, as described in Section IV.E herein. As the Permittee has not yet submitted an approvable CAM plan, the proposed permit would not authorize operation of the kiln and raw mill, pending a significant permit revision to incorporate the provisions of an approved plan.

B. Clinker Cooler

All applicable requirements pertaining to the Clinker Cooler are included in Section I of Attachment "B" of the draft permit.

The Clinker Cooler is subject to emission standards under 40 CFR § 63 Subpart LLL, as described in Section IV.C.3 herein. In addition, this unit is subject to emission limits representing BACT, as described in Section V.C herein, and to emission limits representing maximum actual emissions for dispersion modeling purposes.

All applicable testing, monitoring, recordkeeping, and reporting requirements under 40 CFR § 63 Subpart LLL are included in the draft permit. In addition, where these applicable requirements are not sufficient to assure compliance with the case-by-case emission limitations, the permit includes additional monitoring and reporting requirements. As a result, the Cooler Stack will be equipped with a COMS and the Clinker Cooler Baghouse will be equipped with a pressure drop monitoring system.

The monitoring requirements for the PM_{10} emission limits affecting the Clinker Cooler are subject to CAM rule, as described in Section IV.E herein. As the Permittee has not yet submitted an approvable CAM plan, the proposed permit would not authorize operation of the Clinker Cooler, pending a significant permit revision to incorporate the provisions of an approved plan.

C. Material Handling Sources in Portland Cement Manufacturing Facility

All applicable requirements pertaining to the finish mills, storage bins, bulk loading and unloading systems, and conveying system transfer points in the Portland cement manufacturing facility are included in Section III of Attachment "B" of the draft permit. All of these emissions units are subject to emission standards under 40 CFR § 63 Subpart LLL, as described in Section IV.C.3 herein. In addition, these units are subject to PM emission limits representing BACT, as described in Sections V.D and V.E herein, and to emission limits representing maximum actual emissions for dispersion modeling purposes.

All applicable testing, monitoring, recordkeeping, and reporting requirements under 40 CFR § 63 Subpart LLL are included in the draft permit. In addition, because these applicable requirements are not sufficient to assure compliance with the PM emission limitations, the permit includes additional testing and reporting requirements.

D. Limestone Processing Plant

All applicable requirements pertaining to the limestone processing plant are included in Section III of Attachment "B" of the draft permit. The limestone processing plant comprises the primary crusher, located at the quarry; the belt conveyors used to transfer limestone from the quarry to the Portland cement manufacturing facility, including all transfer points associated with these conveyor belts; and the building that houses the limestone stockpiles. All of these emissions units are subject to emission standards under 40 CFR § 60 Subpart OOO, as described in Section IV.B.4 herein. In addition, these units are subject to PM emission limits representing BACT, as described in Section V.D herein, and to emission limits representing maximum actual emissions for dispersion modeling purposes. Because the BACT limits are more stringent than the PM emission standards under 40 CFR § 60 Subpart OOO, the less stringent PM emission standards have been streamlined out of the permit.

All applicable testing and reporting requirements under 40 CFR § 60 Subpart OOO are included in the draft permit. In addition, because these applicable requirements are not sufficient to assure compliance with the PM emission limitations, the permit includes additional monitoring, recordkeeping, and reporting requirements. As a result, each dust collector in the limestone processing plant will be equipped with a pressure drop monitoring system.

E. Other Material Handling Activities

A small number of material handling activities at the cement plant are not subject to any federal emission standards. These activities include belt conveyors for coal upstream of the coal mill; several enclosed storage piles; and the non-enclosed gypsum storage pile. For administrative convenience, these activities are included in Section IV of Attachment "B" of the draft permit, separate from the activities that are subject to federal NSPS and NESHAP regulations. These units are subject to PM emission limits representing BACT, as described in Section V.D herein, and to emission limits representing maximum actual emissions for dispersion modeling purposes.

The draft permit includes testing, monitoring, recordkeeping, and reporting requirements that are sufficient to assure compliance with the PM emission limitations. The dust collector serving the coal conveying operation will be equipped with a pressure drop monitoring system.

F. Emergency Generator

All applicable requirements pertaining to the emergency generator are included in Section V of Attachment "B" of the draft permit. The emergency generator internal combustion engine is subject to PM, CO, and NO_X emission limits representing BACT, as described in Section V.I herein; to emission limits representing maximum actual emissions for dispersion modeling purposes; and to opacity limits under A.A.C. R18-2-719(E).

The draft permit includes monitoring, recordkeeping, and reporting requirements that are sufficient to assure compliance with the emission limitations. In addition, the permit includes notification requirements pertaining to its status as an emergency, stationary, reciprocating internal combustion engine, and the resulting exclusion from all substantive requirements of 40 CFR § 63 Subpart ZZZ as described in Section IV.C herein.

G. Quarry Operations

All applicable requirements pertaining to blasting, drilling, truck loading, and truck unloading operations in the quarry are included in Section VI of Attachment "B" of the draft permit. These activities are subject to emission limits representing BACT, as described in Section V.F herein, and to emission limits representing maximum actual emissions for dispersion modeling purposes, but are not subject to any specific federal or state emission standards. The draft permit includes recordkeeping and reporting requirements that are sufficient to assure compliance with all emission limitations.

H. Vehicle Traffic

All applicable requirements pertaining to vehicle traffic on unpaved roads in the quarry and on paved roads at the cement plant are included in Section VI of Attachment "B" of the draft permit. This vehicle traffic is subject to work practice requirements representing BACT, as described in Sections V.G and V.H herein, and to emission limits representing maximum actual emissions for dispersion modeling purposes, but is not subject to any specific federal or state emission standards. The draft permit includes recordkeeping and reporting requirements that are sufficient to assure compliance with all emission limitations.

I. Miscellaneous Sources

The Drake Cement facility will include several, miscellaneous activities not directly related to the mining of limestone or the manufacture of Portland cement. All applicable requirements pertaining to these activities are included in Section VII of Attachment "B" of the draft permit. These applicable requirements include work practice requirements and other emission limitations under A.A.C. Articles 6, 7, and 8; 40 CFR § 61 Subpart M; and 40 CFR § 82 Subpart F. The draft permit includes all applicable testing, monitoring, recordkeeping, and reporting requirements under these regulations; a requirement for a source-wide fugitive dust control plan; and additional requirements are sufficient to assure compliance with all applicable emission limitations.

VII. IMPACT ANALYSES

A. General

The proposed Drake Cement facility is located in an area that has been designated as attainment or unclassifiable for all criteria pollutants, therefore, the pertinent requirements for ambient air quality impact analyses and other impact analyses are found in A.A.C. R18-2-406(A)(5) and R18-2-407. The air quality analyses must demonstrate that the project's proposed significant emission increases will not cause or contribute to an exceedance of any applicable National Ambient Air Quality Standard (NAAQS) or PSD increment, nor will they contribute to an increase in ambient concentrations for a pollutant by an amount in excess of the significance level in any adjacent area in which primary or secondary NAAQS for that pollutant are being violated. As noted in Section IV of this Technical Support Document, the criteria pollutants that are proposed to be emitted in significant quantities include NO_x, CO, and PM_{10}.

The NAAQS are maximum concentration "ceilings" measured in terms of the total concentration of a pollutant in the atmosphere. For a new or modified source, compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the background ambient concentrations, the estimated ambient impacts of existing sources of air pollution, and the estimated ambient impacts of the applicant's proposed emissions. A PSD increment, on the other hand, is the maximum increase in ambient concentration that is allowed to occur above a baseline concentration for a pollutant. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment. PSD increments have been established for Class II areas, and at lower acceptable levels for Class I areas such as national parks (to further limit air quality degradation in Class I areas).

Additional analyses required under A.A.C. R18-2-407 include an analysis of the impairment to visibility, soils, and vegetation, and an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the new source or modification.

The proposed project is not located within 50 km of an ozone non-attainment area. Therefore, A.A.C. R18-2-406(A)(5)(b) does not require the presumption that project VOC emissions will contribute to ozone standard violations in any non-attainment areas. No further analysis is required with respect to VOC emissions.

The proposed project is located within 100 km of four Class I areas, and within 50 km of five Class II wilderness areas. The Federal Land Managers for these Class I and II areas have requested analyses of the proposed facility's impacts on visibility and other Air Quality Related Values, in addition to the required Class I PSD increment analyses. The applicant has prepared and submitted these analyses, and the Federal Land Managers have recommended that the permit be issued.

The "ADEQ Air Quality Division Modeling Guidelines," June 22, 1998, presents policy statements and guidance on many air quality analysis issues, including the authority and application of the Arizona Ambient Air Quality Guidelines (AAAQG). Section 1.3 of Appendix B of the Modeling Guidelines describes the Department's current Hazardous Air Pollutant (HAP)/AAAQG program policy, and outlines the legal authority and procedural requirements. In accordance with Department policy, the applicant has submitted an AAAQG modeling analysis as part of the air quality permit application.

The Department's technical requirements and guidance for air quality analyses are described in the "ADEQ Air Quality Division Modeling Guidelines." Additionally, the Department has adopted U.S. EPA's guidance for performing PSD air quality analyses as set forth in the "Guideline on Air Quality Models," codified in appendix W to 40 CFR Part 51, and in Chapter C of the October 1990 draft New Source Review Workshop Manual.

B. Modeling Protocol

For a PSD permit application, the Department requires the submittal and subsequent approval of a dispersion modeling protocol before modeling analysis results are accepted. Development of the modeling protocol document guides the applicant in fulfilling all necessary requirements, and a recommended protocol format and content is described in the ADEQ Modeling Guidelines. The Department reviews the protocol and provides comments to the applicant on any deficiencies. After approval of the modeling protocol, the Department will then accept the modeling report.

After collecting a year of on-site meteorological data, as described in Section VII.C herein, the Permittee[2] prepared and submitted a modeling protocol in June 2002. The protocol was reviewed, and in general it conformed to Department policies. Minor comments were provided to the applicant on June 21, 2002.

The Department received the original submittal of the "Prevention of Significant Deterioration Air Quality Impact Analysis Report" in February 2003 and provided comments to the Permittee in March 2003. The

[2] This submittal was made by Stirling Bridge, L.L.C, the prior owner of the assets now controlled by Drake Cement.

Department received a revised modeling protocol in May 2004, provided comments to the Permittee in June 2004, and received a protocol supplement in October 2004.

The ambient air quality impact analysis results were documented in a January 2005 air quality modeling report. The Department reviewed the modeling report and deemed the analysis incomplete in January 2005. Additional information was provided by the Permittee in February 2005 which addressed the near field modeling concerns.

The Class I area impact analysis results presented in the January 2005 modeling report showed potential impacts on visibility in Class I areas. In response to concerns expressed by the Federal Land Managers with regard to these impacts, the Permittee prepared and submitted a modeling report addendum in May 2005.

Also in May 2005, the Permittee revised the emission limits that were proposed to represent Best Available Control Technology, as described in Section IV herein. This revision had the effect of changing the emissions inventory. Revised modeling analysis results were submitted to the Department and to the Federal Land Managers in August 2005.

C. Meteorological Data

An on-site meteorological tower was installed in February 2001 to obtain representative data for use in the dispersion modeling analyses. On-site meteorological data were collected from February 2001 through January 2002. This data set had a valid recovery rate of approximately 100%, and was approved by the Department as representative onsite data set for regulatory modeling purposes.

Drake Cement is located in between Prescott and Flagstaff, near the town of Drake. The topography of the region is characterized by canyons, river valleys, mountains, and plateaus, as illustrated in Figure VII-1. Drake Cement is located in the Hell Canyon drainage of Big Black Mesa, which has an axis aligned with north-northwest to southeast. Winds in the area near Drake Cement are characterized primarily by north-northwest flow as illustrated by the annual wind rose for Drake Cement. During the daytime, however, a reversal of wind direction is observed, coming from the southeast-through southwest sector, as illustrated in Figure VII-2.

Hell Canyon drains into the Verde Valley to the south of Sycamore Canyon. The Verde River rains meanders through the Verde Valley, which generally has a west-northwest to east-southeast axis. Winds in this region are represented by the wind rose for Phoenix Cement, located near the town of Clarkdale. The wind rose for Phoenix Cement is illustrated in Figure VII-1, which shows winds primarily from the west. The diurnal pattern of winds from this site are illustrated in Figure VII-3, which shows nighttime drainage flows from the west, and day time flows up the river valley from the east-southeast.

On the Plateaus, near Prescott and Flagstaff, southwest winds dominate the flow. An analysis of the diurnal variation in the winds from these sites illustrates how these winds change direction as a function of the time of day, as typically observed in complex terrain. Figure VII-4 illustrates that the wind at Prescott between midnight and 6 am is most frequently from the south-southwest. This pattern reverses with daytime heating in which winds are most frequently from the north during light winds and from the southwest during stronger winds. The north wind is likely associated with radiatively forced upslope flows, whereas the daytime southwest flow is likely associated with boundary layer coupling of the regional or synoptic layer flows.

Figure VII-5 illustrates the diurnal wind pattern at Flagstaff. During the nighttime, winds are predominantly from the southwest, and from the northeast during the day. This pattern reflects the nocturnal drainage winds from the higher terrain to the southwest and a reversal of flow during the day, as the terrain heats up, driving an upslope flow.

Figure VII-1 Topography & Meteorology

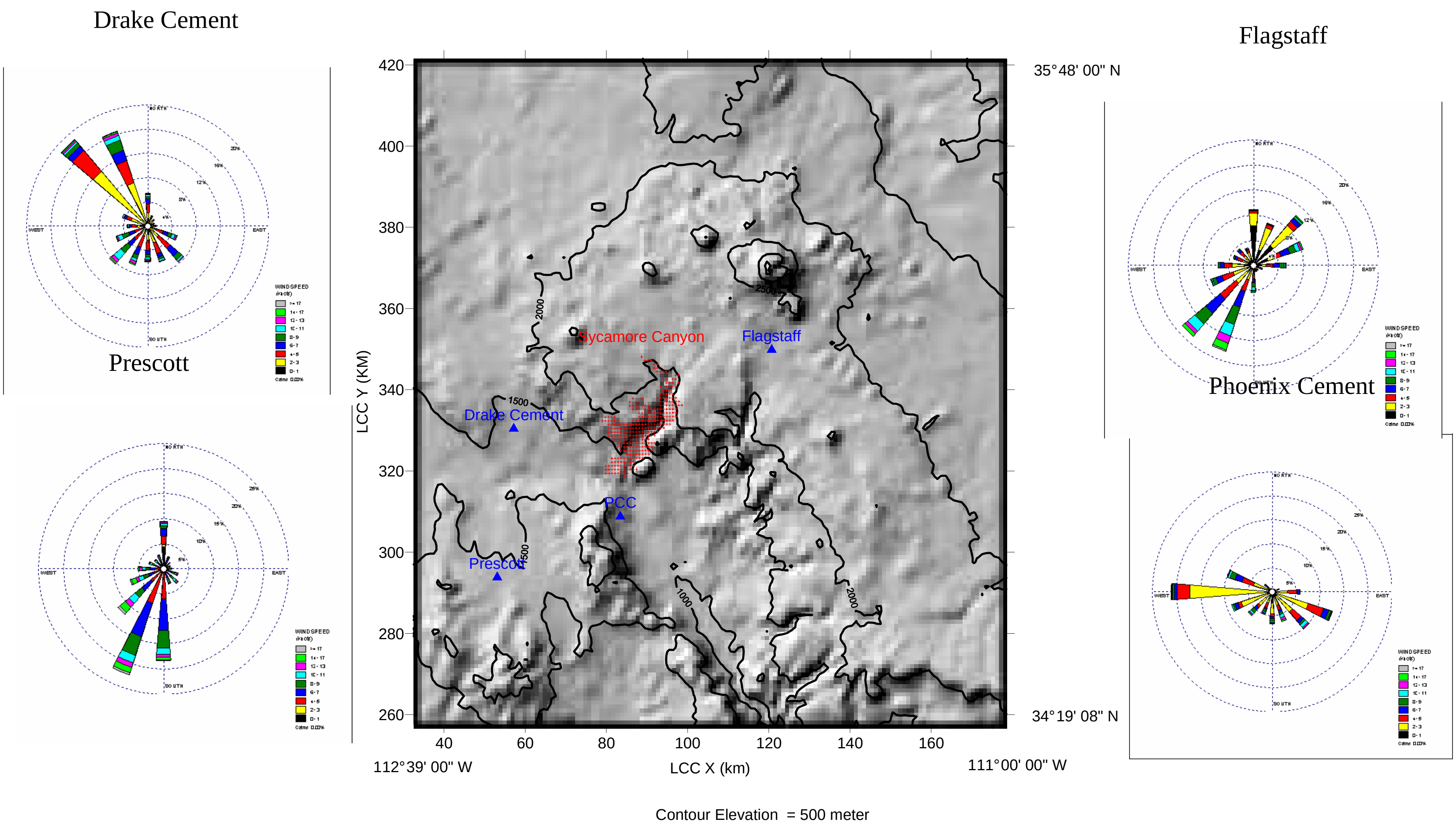
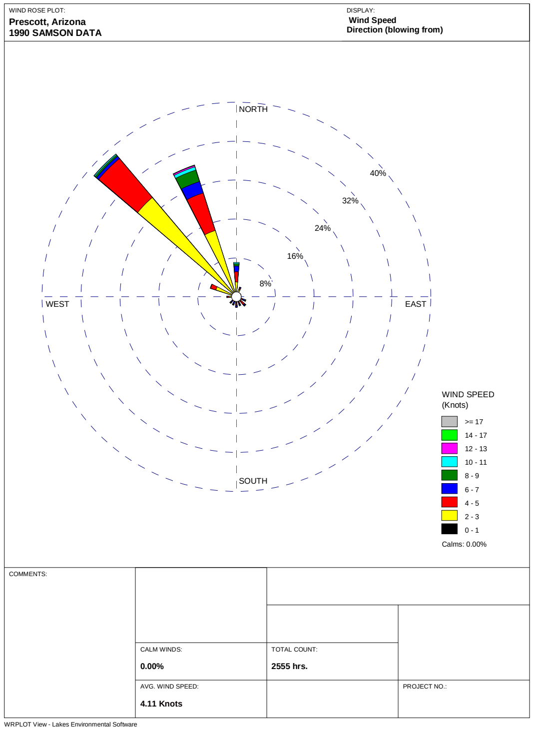


Figure VII-2 Diurnal Wind Rose for Drake Cement

Midnight to 6 am



10 am to 4 p.m.

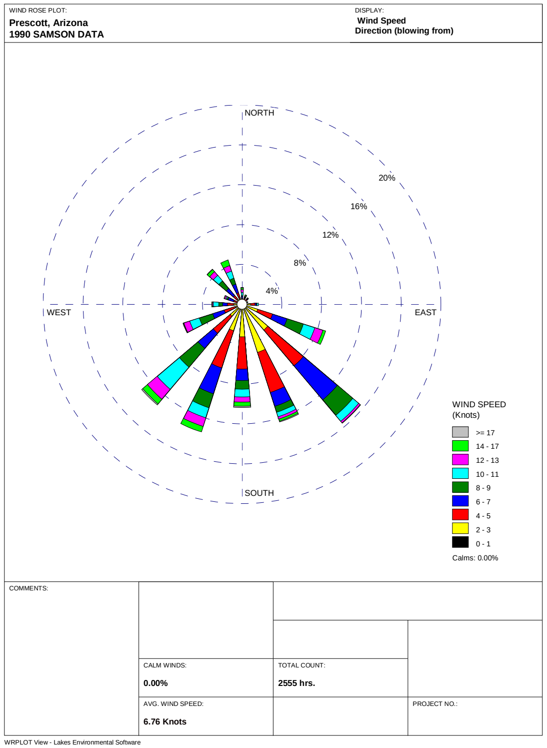
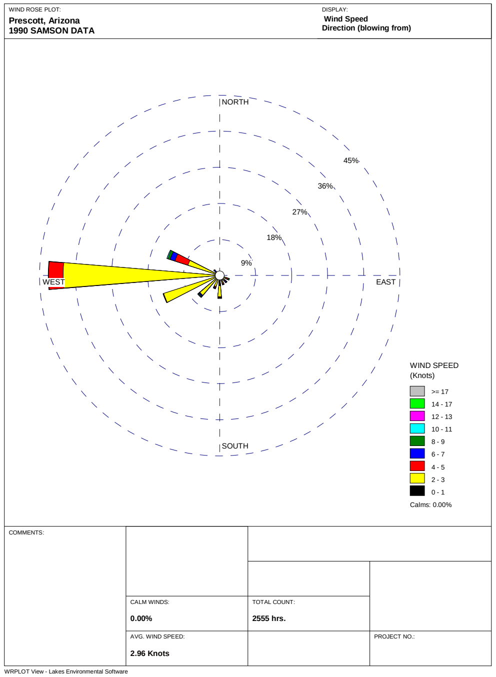


Figure VII-3 Diurnal Wind Rose for Phoenix Cement

Midnight to 6 am



10 am to 4 p.m.

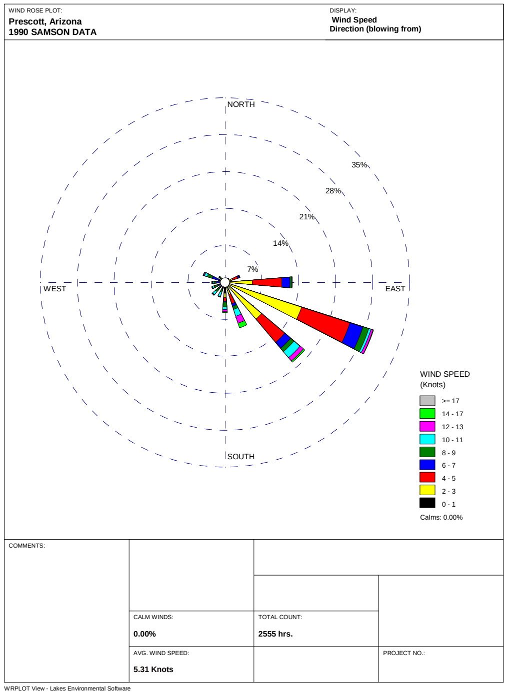
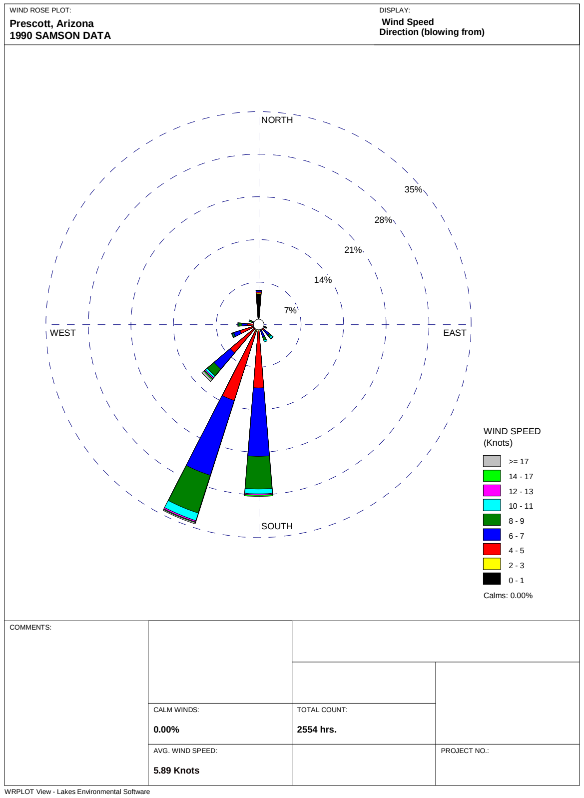


Figure VII –4 Diurnal Windroses for Prescott, Arizona

Midnight to 6 am



10 am to 4 p.m.

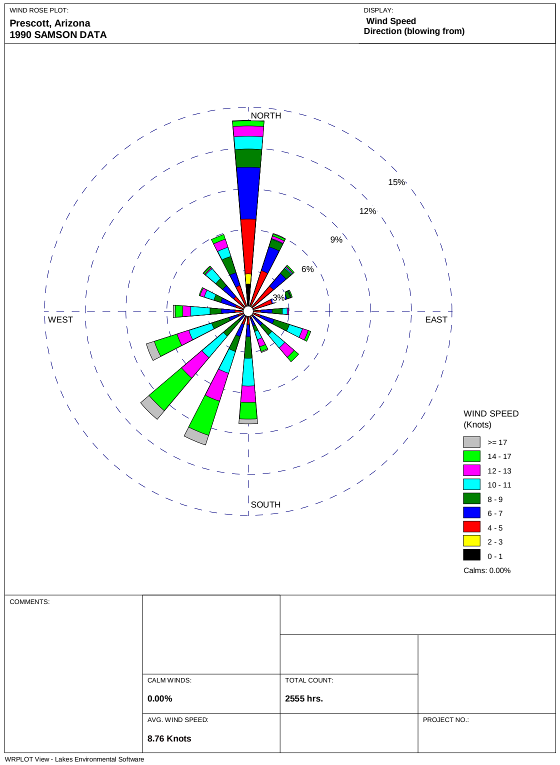
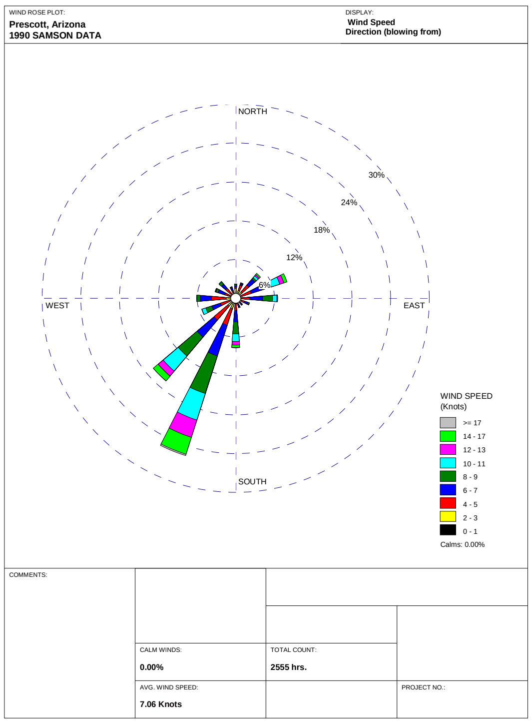
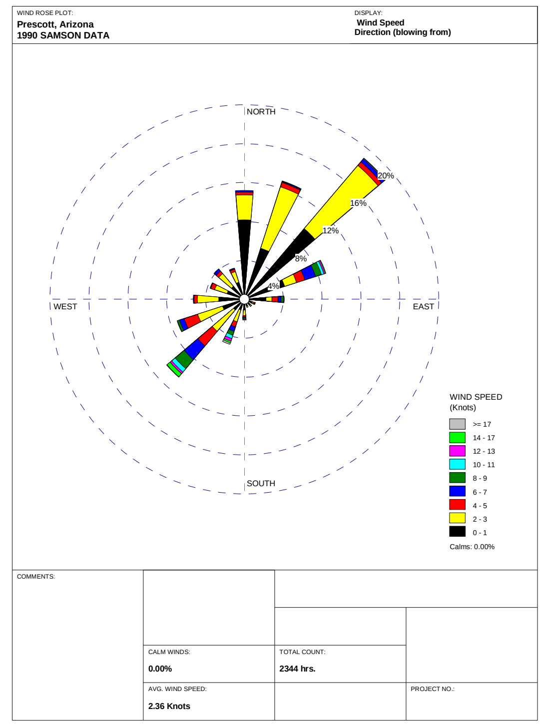


Figure VII-5 Diurnal Wind Roses for Flagstaff, Arizona

Midnight to 6 am



10 am to 4 p.m.



D. Computer Models and Receptor Grids

Model selection was based upon the U.S. EPA's Guidelines on Air Quality Models. The guidelines contain recommendations of preferred models for specific applications. Two models were selected for quantifying air quality impacts from Drake Cement. The Industrial Source Complex – Short Term Version 3 (ISCST3) was used for the near field analyses (i.e., less than 50 km). CALPUFF was used to quantify air quality impacts in Class I areas beyond 50 km and for quantifying air quality related values (AQRVs) of visibility and acid deposition in Class I areas. Each of these models is discussed below.

1. ISCST3

The Industrial Source Complex – Short Term Version 3 (ISCST3) was used for the near field analyses (i.e., less than 50 km). These analyses included the determination of significant impacts, PSD increment consumption, NAAQS compliance, and comparison with the AAAQG. ISCST3 (also referred to as ISC) is a Gaussian plume model which utilizes hourly meteorological observations to create a homogeneous wind field to transport and disperse pollutants.

ISC characterizes the turbulence planetary boundary layer through series of empirically derived, distant dependent turbulence parameters, referred to as the Pasquill-Gifford (PG) dispersion curves. These curves were developed on short-range dispersion from ground-level sources in flat, open grassland areas with a surface roughness length of 0.03 meters. As with all empirically derived parameterizations, the PG dispersion curves have their limits both in space and time.

The simplicity of the Gaussian plume assumption has its limitation in complex terrain and beyond 50 km from the source. Complex I, as contained within ISC, utilizes a 22.5° sector (crosswind) average concentration, where any plume within the designated sector is equally transported to all receptors within the arc (for point source and volume sources only).

For area sources, ISC does not employ a complex terrain algorithm. The model truncates the terrain heights, treating the receptor elevation as if it were at the same height as the top of the storage pile. Hence, ISC models the plume emitted from area sources as if it is transported over flat terrain.

ISC was run with the regulatory default option, rural land use dispersion coefficients, and building downwash. Direction specific building parameters were obtained from the U.S. EPA Building Input Profile Program (BPIP) based upon the building configuration illustrated in Figure VII-6. Building downwash algorithms contained within ISC are based upon the Huber-Synder and Scire-Schulman algorithms. The more recently proposed Plume Rise Model Enhancements (PRIME) algorithms were not used.

Air quality impacts calculated by ISCST3 were determined with a receptor grid as shown in Figures VII-7 and VII-8. The grid utilizes a UTM map projection for its coordinate system expressed in meters. Receptors were placed every 25 meters along the two process area boundaries and extending out 200 meters from these boundaries as shown in Figure VII-7. Outward from this, receptor spacing decreased to 100 meters apart, extending out to 5 km (5.2 km from the process area boundary). Outward from this, receptor spacing decreased to 500 meter, extending out to 17 km (17.2 km from the process area boundary). The entire receptor grid is illustrated in Figure VII-8. Receptor elevations were obtained from USGS digital elevation maps.

ISCST3 was run using one year of on-site meteorological data. The data were collected from February 3, 2001 to February 2, 2002. Concurrent upper air data from Flagstaff were used to characterize mixing height. Hourly values of cloud cover, solar radiation, barometric pressure, and precipitation were obtained from Prescott.

Figure VII-6 Building Layout Used for Downwash Analysis

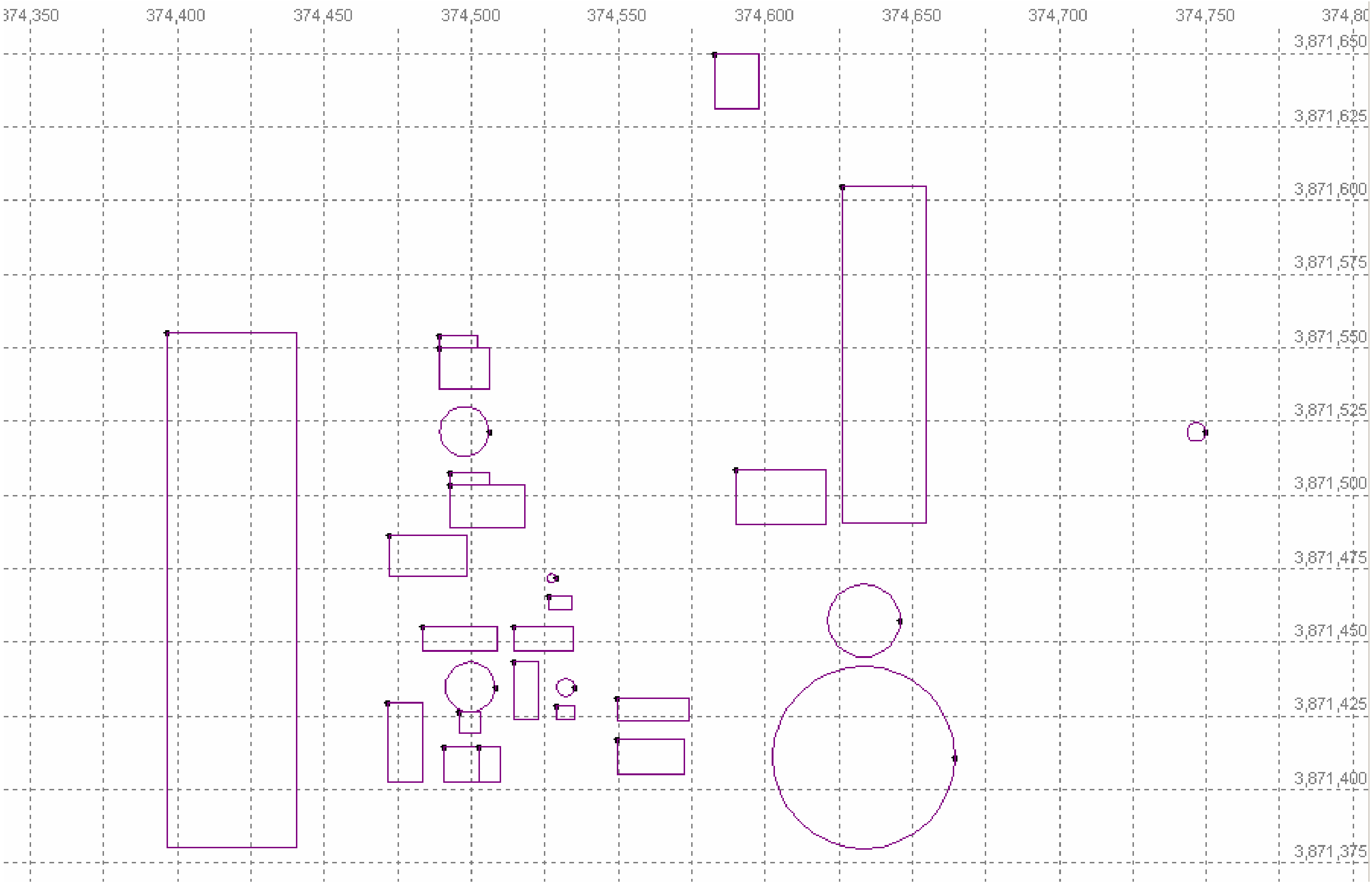


Figure VII-7. Near Field Receptor Grid

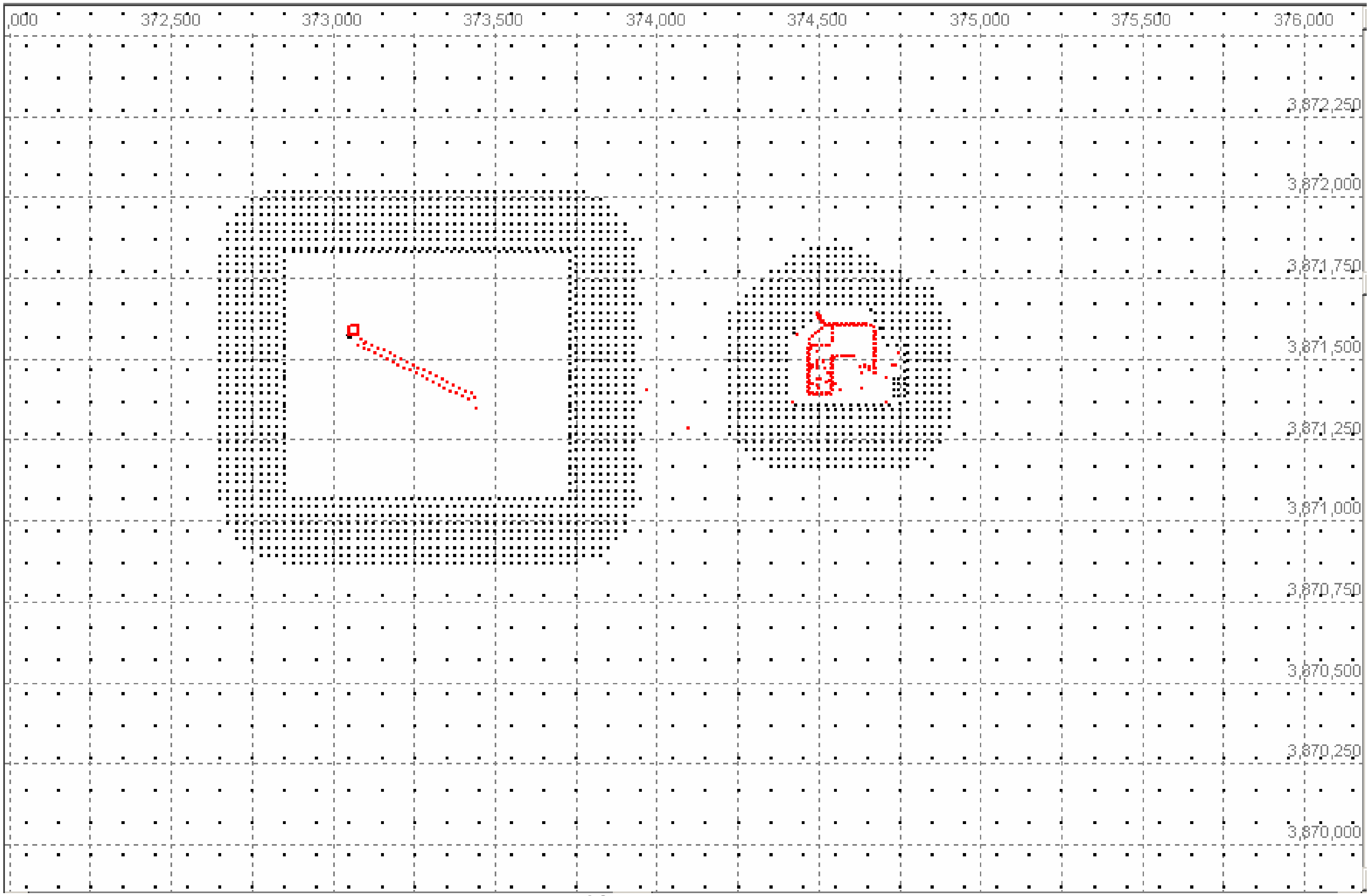
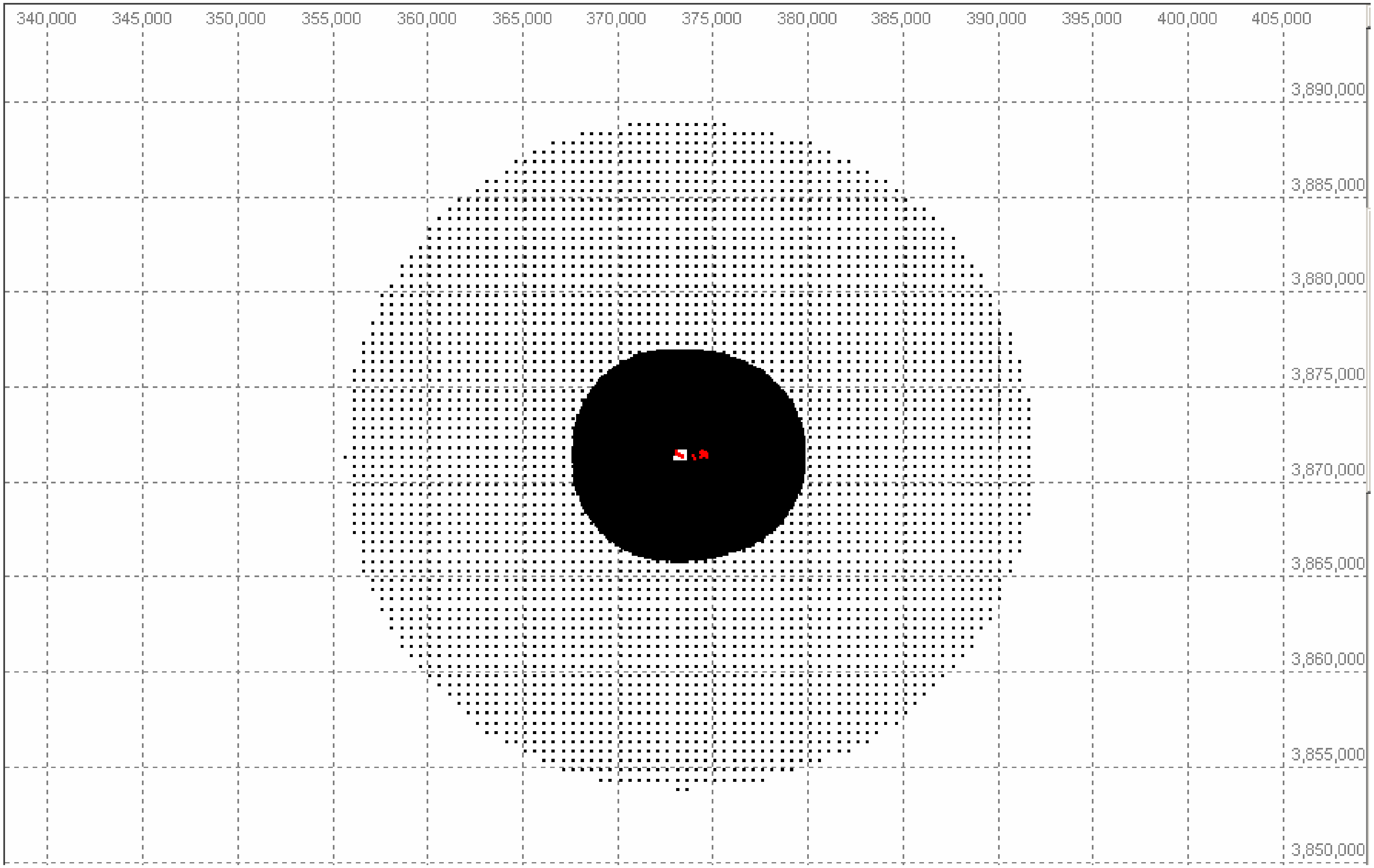


Figure VII-8. Receptor Grid



2. CALPUFF

The CALPUFF modeling system includes three main components: CALMET, CALPUFF, and CALPOST and a large subset of preprocessing programs designed to interface the model to standard routinely-available meteorological and geophysical data sets. In the simplest terms, CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modeling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET.

CALPUFF is a transport and dispersion model that advects "puffs" of material emitted from modeled sources, simulating dispersion and transformation processes along the way. CALPUFF can be run in a screening mode or a refined mode. In the screening mode, CALPUFF utilizes a homogenous wind field based upon hour observations of meteorology from a single meteorological station. In the refined mode, it uses 3-dimensional wind fields generated by CALMET. Temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period. The primary output files from CALPUFF contain either hourly concentrations or hourly deposition fluxes evaluated at selected receptors locations.

CALPOST is used to process these files, producing tabulations that summarize the results of the simulation, identifying the highest and second highest 3-hour average concentrations at each receptor, for example. When performing visibility related-modeling, CALPOST uses concentrations from CALPUFF to compute extinction coefficients and related measures of visibility, reporting these for selected averaging times and locations.

3. CALPUFF Screening Mode

CALPUFF was initially run in its screening mode using 5 years (1986-1990) of hourly surface observations from Prescott with concurrent twice daily mixing heights observed at Winslow.

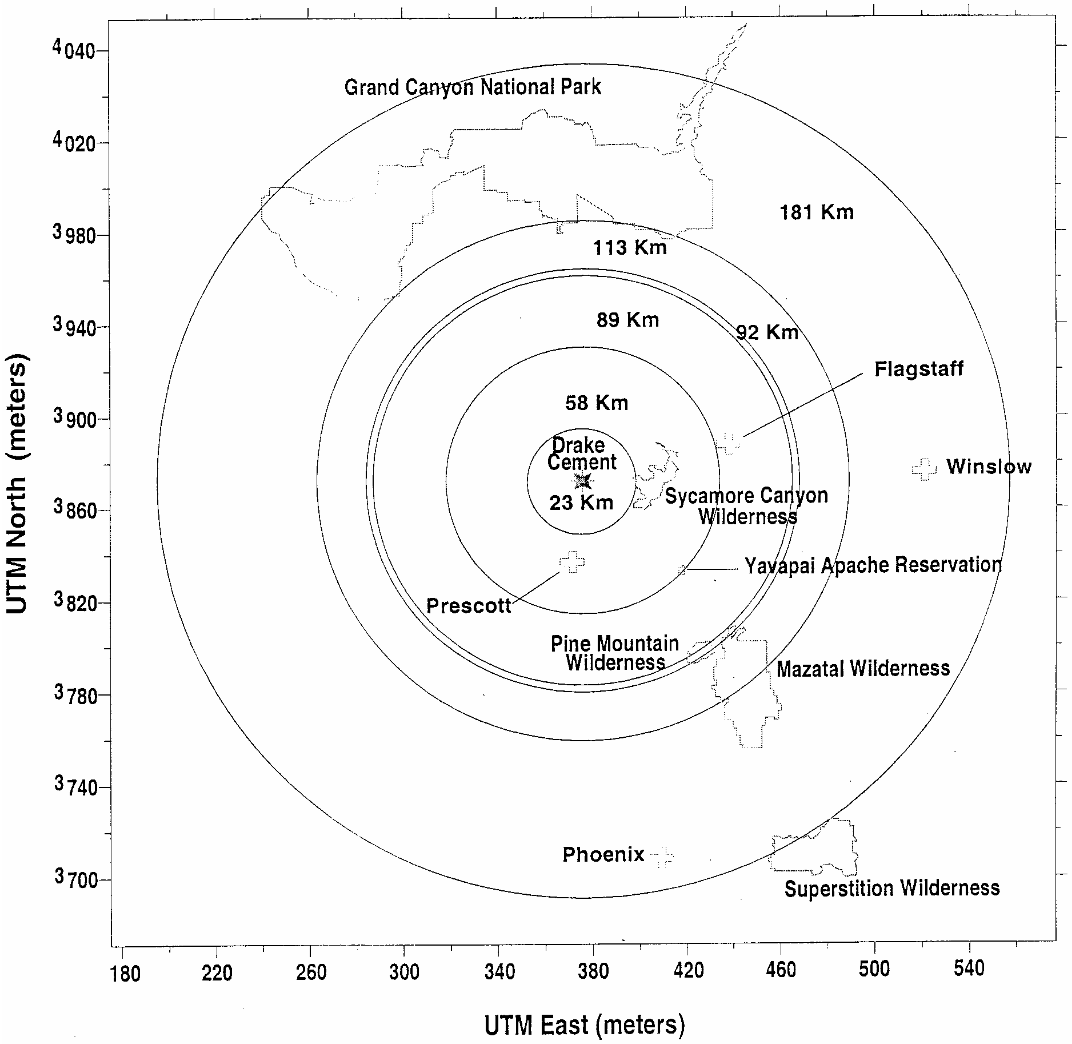
Table VII-1 presents a list of the Class I areas within 200 km of Drake Cement. The table lists the responsible Federal Land Manager and the nearest distance to the Class I area.

Table VII-1. Class I Areas Near Drake Cement

Class I Area	Federal Land Manager	Nearest Distance to Drake Cement (km)
Sycamore Canyon Wilderness	USFS	23
Yavapai-Apache Reservation	Tribe	58
Pine Mountain West Wilderness	USFS	89
Mazatzal Wilderness	USFS	92
Grand Canyon National Park	NPS	113
Superstition Wilderness	USFS	181

Figure VII-9 illustrates the location of each Class I area with respect to Drake Cement. In the screening mode, receptor rings are used, instead of site-specific receptors to quantify impacts. A receptor ring is created for each Class I area with a radius equal to the nearest distance to its boundary. Each ring consists of receptors placed at each degree (i.e., 360 receptors per ring). The elevation of each receptor on the ring is set equal to the elevation of the topography within the arc intercepting the Class I area. If more than one elevation is encountered, two rings are used: one ring has the receptors set at the minimum elevation and the other set equal to the maximum elevation. The maximum impact anywhere on the receptor ring is used to represent the impacts within the Class I area, regardless of wind direction; hence the term “screening.”

Figure VII-9 Location of Class I Areas and Receptor Rings



4. CALPUFF Refined Mode

CALPUFF was run in a refined mode only for Sycamore Canyon. In the refined mode, CALPUFF was run with hourly 3-dimensional meteorological fields created by CALMET. These meteorological fields allow for more realistic conditions for which to transport and disperse puffs of pollutant as compared to the homogeneous conditions used in the screening analysis. As such, receptors were only placed in the Class I areas. These receptors typically have 1 km spacing and were obtained from the National Park Service website. In addition, the enhanced meteorology allows for the use of alternative turbulence parameters to disperse pollutants and the use of hourly relative humidity values which serve as the basis of hygroscopic particle scattering used in the visibility assessment.

Time and space-varying meteorological fields of data created by CALMET are based upon an initial guess field created by the MM4 or MM5 meteorological model, which are adjusted for the influence of terrain, and nudged with supplemental surface and upper air observations. Historically, the standard set of years to be modeled include 1990, 1992, and 1996, as obtained from the National Park Service. The 1990 data is based upon output from the MM4 model with 80 km horizontal resolution. The 1992 data is based upon the updated MM5 meteorological model, also with 80 km resolution. The 1996 data is also obtained from the MM5 model, but with 36 km resolution.

The MM5 model output was nudged with surface observations from Flagstaff and Prescott; and upper air data from Winslow and Flagstaff. For the Sycamore Canyon Analysis, CALMET and CALPUFF was run with a 100 km by 100 km grid centered on Drake Cement, with a horizontal grid cell spacing of 2 km.

E. Downwash and Good Engineering Practice (GEP) Stack Height Analysis

Because of the effect of building downwash, BPIP, was used to calculate the building downwash parameters for input to ISCST3. All the facility stacks are subject to downwash. The building locations and GEP analysis were independently confirmed. All stacks are below the minimum 65 meter allowable GEP height.

Figure VII-10 illustrates the location of the sources in the main processing area of the plant. The sources are shown on a UTM map projection with Easting and Northing indicated in meters. Similarly, Figure VII-11 illustrates the source locations in the quarry area. The main plant is located near 374,500 meters east, approximately 1.5 km east of the quarry, as indicated by the square. The roads are widely distributed and thus dominate each figure. However, close inspection reveals the model ID of each source.

Figure VII-10. Source Locations in Main Plant Area

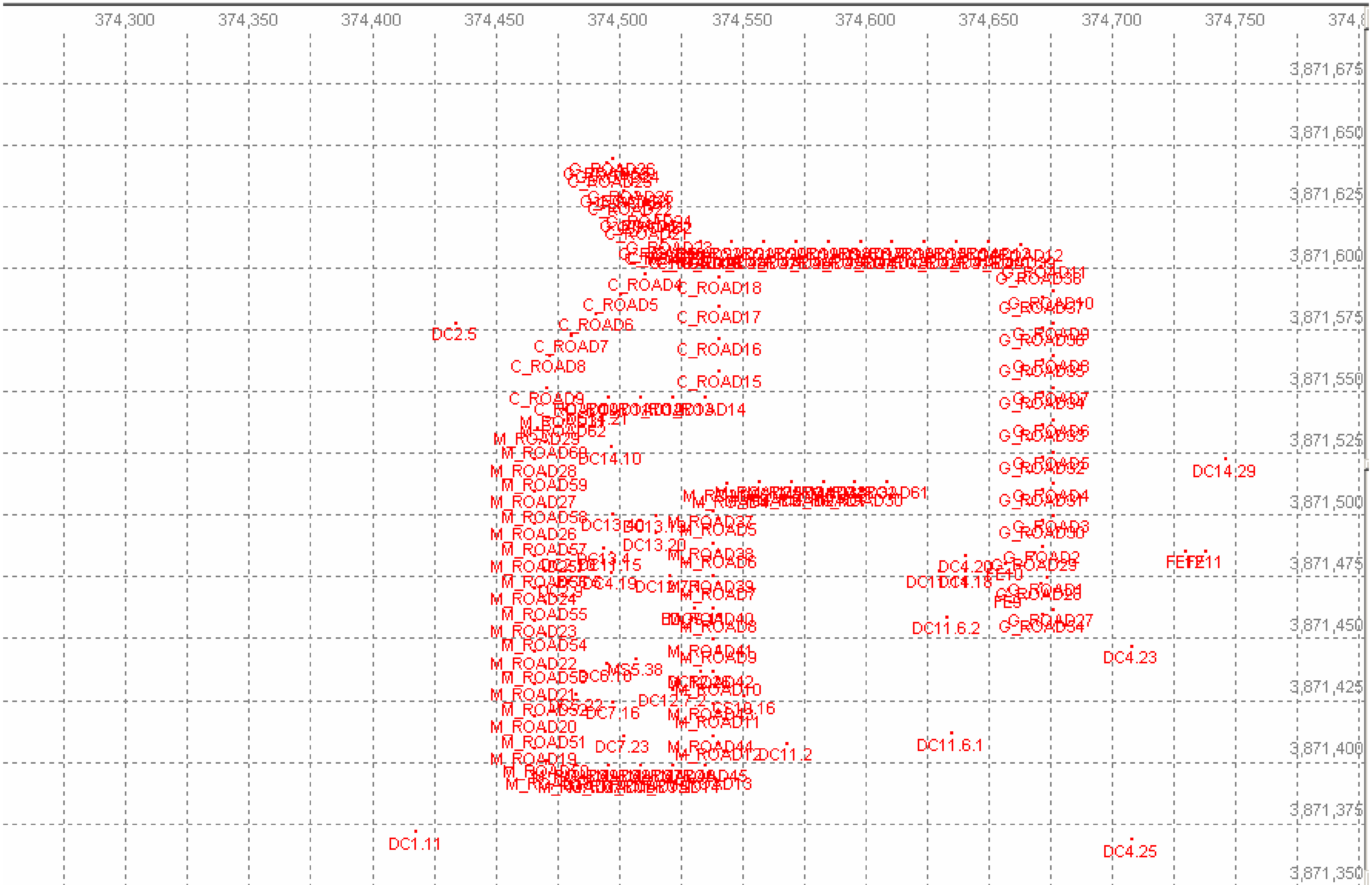
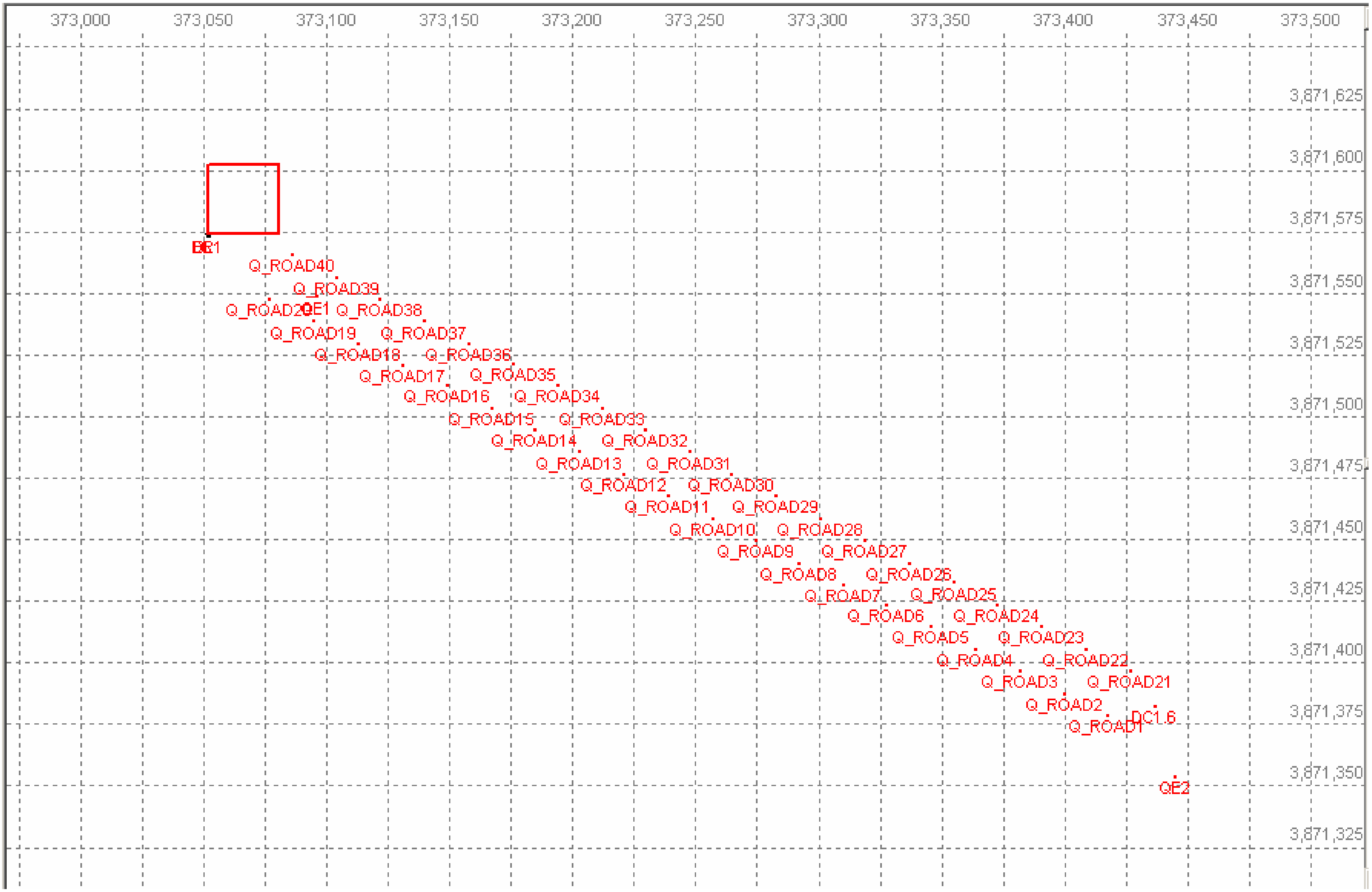


Figure VII-11. Source Locations in Quarry Area



F. Modeled Emission Rates

Based upon the August 2005 submittal, Drake Cement is a major source of NOx, CO, PM_{10}, and VOC. It was also a major source of SO_2 when it submitted its modeling application in January 2005, but since has decreased its emissions below the major source threshold for SO_2.

There are two modes of operations at the facility: the primary operating mode and an alternative operating mode. The alternative operating mode differs from the primary operating mode only in that limestone is imported from off site via railroad and truck, rather than produced from Drake's quarry.

Table VII-2 presents the modeled emission rates for the primary operating scenario. There are two modeled stacks emitting NO_X, SO_2, and CO: the main stack and an emergency generator. All other sources emit only PM_{10}. In addition to the main stack, PM_{10} is emitted from the primary crusher, cement grinding, the clinker cooler stack, and quarry road dust.

Some of these sources are subject to operating restrictions that will limit capacity utilization. In order to reflect these operating restrictions, the quarry trucks and drilling (QE1, QE2, and DR1) were modeled as if they will operate for ten hours each day; quarry blasting (DR1) and the emergency generator were modeled as if they will operate for one hour each day; the end dump transport truck to gypsum storage pile (FE9), front end loader dumping to the gypsum storage pile (FE10), and the truck receiver bin (FE12) were modeled as if they will operate for four hours each day; railcar receiving (FE11) was modeled as if it will operate for eight hours each day.

Table VII-3 presents the modeled emission rates for rail car and truck receiving in the alternative operating scenario. Only PM_{10} is emitted from these activities. Railcar and truck receiving were modeled as if they will operate for twelve hours each day and six hours each day, respectively.

Tables VII-4 and VII-5 present the modeled exhaust parameters for all point sources and volume and area sources, respectively.

Only two emission points will emit significant quantities of hazardous air pollutants subject to the AAAQG: the main pyroprocessing stack and the diesel-fired emergency generator. Table VII-6 presents the emission rates of the AAAQG pollutants from each emission source.

Table VII-2. Point, Volume, and Area Source Modeled Emission Rates (g/sec)

Model ID	**Process or Activity**	**PM10 (24-hr)**	**PM10 (Annual)**	**CO**	**NOx**	**SO_2**
DC.1.6	Primary Crusher	1.02E-01	3.64E-02			
DC1.8	Overland Belt Conveyor	1.93E-02	6.87E-03			
DC1.10	Overland Belt Conveyor	1.93E-02	6.87E-03			
DC1.11	Overland Belt Conveyor	3.86E-02	1.37E-02			
DC2.5	Belt Conveyor Under Limestone Pile	1.93E-02	1.93E-02			
DC2.9	Belt Conveyor to Limestone Silos	5.19E-02	5.19E-02			
DC2.10	Belt Conveyor to Iron Ore & Limestone Silos	5.19E-02	5.19E-02			
DC4.18	Belt Conveyor to Belt Conveyor	1.51E-02	1.51E-02			
DC4.19	Belt Conveyor to Coal and Aluminum Silos	5.54E-02	5.54E-02			
DC4.20	Belt Conveyor to Belt Conveyor	3.25E-02	3.25E-02			
DC4.23	Belt Conveyor to Belt Conveyor	1.51E-02	1.51E-02			
DC4.25	Belt Conveyor to Belt Conveyor	1.51E-02	1.51E-02			
DC5.5	Raw Grinding Feeding System	5.69E-02	5.69E-02			
DC5.22	Raw Grinding Feeding System Components	3.19E-02	3.19E-02			
DC6.10	Top of Blending Silos	3.38E-02	3.38E-02			
DC7.16	Kiln Feed	2.11E-02	2.11E-02			
DC7.23	Top of Preheater Tower	1.53E-02	1.53E-02			
DC11.2	Clinker Cooler Discharge to Conveyor	2.54E-02	2.54E-02			
DC11.6.1	Conveyor to Dome & Belt Conveyor	1.63E-02	1.63E-02			
DC11.6.2	Belt Conveyor to Emergency Silos	1.87E-02	1.87E-02			
DC11.11	Belt Conveyor to Silos	6.15E-02	6.15E-02			
DC11.15	Belt Conveyors to Gypsum & Clinker Silos	5.31E-02	5.31E-02			
DC12.7.1	Belt Conveyor to Coal Grinding Dept.	1.32E-02	1.32E-02			
DC12.7.2	Coal Mill Pneumatic Pump	2.33E-03	2.33E-03			
DC12.26	Pulverized Coal Silo	1.28E-02	1.28E-02			
DC13.4	Belt Conveyor to Cement Grinding Dept.	1.71E-02	1.71E-02			
DC13.19	Cement Grinding Dept.	1.10E-01	1.10E-01			
DC13.20	Cement Grinding Dept.	1.10E-01	1.10E-01			
DC13.40	Cement Grinding Dept.	1.31E-01	1.31E-01			
DC14.10	Top of Cement Silos	1.79E-02	1.79E-02			
DC14.21	Top of Metallic Silos for Bulk Loading	4.54E-02	4.54E-02			
DC14.29	Top of Metallic Silos for Bulk Loading	2.98E-02	2.98E-02			
MS5.38	Main Stack	7.53E-01	7.53E-01	37.9	12.0	6.31E-01
CD10.16	Clinker Cooler Stack	2.81E-01	2.81E-01			
EDG9.11	Emergency Generator	7.95E-02	7.95E-02	0.243	1.13	7.43E-02
FE9	End Dump Trans. Truck to Gypsum Stor. Pile	7.95E-04	6.79E-04			
FE10	Front End Loader Dump – Gypsum Reclaim	1.99E-03	1.70E-03			
FE11	Railcar Receiver Bin	3.59E-03	3.07E-03			
FE12	Truck Receiver Bin	1.08E-03	9.20E-04			
QE1	Quarry Truck Loading with Pay loader	1.00E-03	1.00E-03			
QE2	Quarry Truck Unloading into Prim. Crusher Hopper	2.50E-04	2.50E-04			
DR1	Wet Drilling for Charges	4.28E-06	4.28E-06			

BL1	Limestone Blasting	3.82E-05	3.82E-05			
C_ROAD	Cement Truck Roadway Dust	5.33E-02	5.33E-02			
G_ROAD	Gypsum Truck Roadway Dust	5.45E-03	5.45E-03			
M_ROAD	Maintenance Truck Roadway Dust	6.01E-03	6.01E-03			
Q_ROAD	Quarry Road Dust	6.80E-01	6.80E-01			

Table VII-3. Alternative Operating Scenario (Imported Limestone) Volume Source Modeled Emission Rates (g/sec)

Model ID	**Process or Activity**	**PM10 (24-hr)**	**PM10 (Annual)**	**CO**	**NOx**	**SO2**
FE11	Railcar Receiving Bin	5.38E-03	4.60E-03			
FE12	Truck Receiving Bin	1.61E-03	1.38E-03			

Table VII-4. Modeled Point Source Parameters

Model ID	**Process or Activity**	**Stack Height (m)**	**Exhaust Temp (K)**	**Exhaust Velocity (m/s)**	**Stack Diameter (m)**
DC.1.6	Primary Crusher	20.	303	16.49	0.73
DC1.11	Overland Belt Conveyor	32	303	16.37	0.45
DC2.5	Belt Conveyor Under Limestone Pile	15	303	15.22	0.33
DC2.9	Belt Conveyor to Limestone Silos	36.13	303	15.87	0.53
DC2.10	Belt Conveyor to Iron Ore & Limestone Silos	36.13	303	15.87	0.53
DC4.18	Belt Conveyor to Belt Conveyor	9.20	303	16.54	0.28
DC4.19	Belt Conveyor to Coal and Aluminum Silos	36.13	303	16.95	0.53
DC4.20	Belt Conveyor to Belt Conveyor	24.70	303	16.59	0.41
DC4.23	Belt Conveyor to Belt Conveyor	33.15	303	16.54	0.28
DC4.25	Belt Conveyor to Belt Conveyor	29.75	303	16.54	0.28
DC5.5	Raw Grinding Feeding System	34.13	303	15.05	0.57
DC5.22	Raw Grinding Feeding System Components	27.	353	15.83	0.45
DC6.10	Top of Blending Silos	55	353	16.71	0.45
DC7.16	Kiln Feed	17.50	353	12.58	0.41
DC7.23	Top of Preheater Tower	65.0	353	14.06	0.33
DC11.2	Clinker Cooler Discharge to Conveyor	13.60	353	14.89	0.41
DC11.6.1	Conveyor to Dome & Belt Conveyor	41	333	14.15	0.33
DC11.6.2	Belt Conveyor to Emergency Silos	36.30	333	16.2	0.33
DC11.11	Belt Conveyor to Silos	19.50	303	16.26	0.57
DC11.15	Belt Conveyors to Gypsum & Clinker Silos	36.13	303	16.24	0.53
DC12.7.1	Belt Conveyor to Coal Grinding Dept.	12.15	303	14.43	0.28
DC12.7.2	Coal Mill Pneumatic Pump	17.50	353	16.21	0.12
DC12.26	Pulverized Coal Silo	36.0	303	16.32	0.26
DC13.4	Belt Conveyor to Cement Grinding Dept.	10.75	303	13.53	0.33
DC13.19	Cement Grinding Dept.	47.0	363	16.12	0.84
DC13.20	Cement Grinding Dept.	47.0	363	16.12	0.84
DC13.40	Cement Grinding Dept.	49.0	363	16.69	0.9
DC14.10	Top of Cement Silos	54.50	353	16.49	0.33

DC14.21	Top of Metallic Silos for Bulk Loading	33.0	353	16.18	0.53
DC14.29	Top of Metallic Silos for Bulk Loading	34.30	353	14.73	0.45
MS5.38	Main Stack	65.0	363	18.0	1.99
CS10.16	Clinker Cooler Stack	65.0	503	18.01	1.88
EDG9.11	Emergency Generator	7.50	805	16.12	0.26

Table VII-5. Modeled Volume and Area Source Parameters

Model ID	**Process or Activity**	Source Type	Release Height (m)	Initial Lateral Dimensions (m)	Initial Vertical Dimensions (m)
FE9	End Dump Trans. Truck to Gypsum Stor. Pile	Volume	1.25	0.58	2.1
FE10	Front End Loader Dump – Gypsum Reclaim	Volume	4.12	0.72	0.57
FE11	Railcar Receiver Bin	Volume	1.00	1.00	1.81
FE12	Truck Receiver Bin	Volume	1.10	0.70	2.56
QE1	Quarry Truck Loading with Pay loader	Volume	4.57	0.88	0.83
QE2	Quarry Truck Unloading into Prim. Crusher Hopper	Volume	1.52	0.91	4.03
DR1	Wet Drilling for Charges	Area	0	28.27	28.27
BL1	Limestone Blasting	Area	0	28.27	28.27
C_ROAD	Cement Truck Roadway Dust	Volume	3.7	6.05	3.44
G_ROAD	Gypsum Truck Roadway Dust	Volume	3.1	6.05	2.88
M_ROAD	Maintenance Truck Roadway Dust	Volume	2.45	6.05	2.28
Q_ROAD	Quarry Road Dust	Volume	4.57	9.3	4.25

Table VII-6. AAAQG Emission Inventory

Compound	**MS5.38**		**EDG9.11**	
	Max. Rate (lb/hr)	**Max Rate (g/sec)**	**Max Rate (lb/hr)**	**Max Rate (g/sec)**
1,3 butadiene			7.95E-05	1.00E-05
Acetaldehyde			1.56E-03	1.97E-04
Acrolein			1.88E-04	2.37E-05
Ammonia as NH3	5.00E+00	6.30E-01		
Arsenic	1.00E-03	1.26E-04		
Barium	3.83E-02	4.83E-03		
Benzene	1.33E+00	1.68E-01	1.90E-03	2.39E-04
Benzo(a)anthracene	3.58E-06	4.51E-07	3.42E-06	4.31E-07
Benzo(a)pyrene	1.08E-05	1.36E-06	3.82E-07	4.81E-08
Beryllium	5.50E-05	6.93E-06		
Cadmium	1.83E-04	2.31E-05		
Chromium	1.17E-02	1.47E-03		
Copper	4.42E-01	5.57E-02		
Dibenz(a,h)anthracene	5.25E-05	6.62E-06	1.19E-06	1.50E-07
Dioxins	2.25E-07	2.84E-08		
Dibenzofurans	2.42E-08	3.05E-09		

Formaldehyde	3.83E-02	4.83E-03	2.40E-03	3.02E-04
Hydrochloric Acid	1.17E+01	1.47E+00		
Mercury	2.00E-03	2.52E-04		
Naphthalene	1.42E-01	1.79E-02	1.72E-04	2.17E-05
Propylene			5.25E-03	6.62E-04
Selenium	1.67E-02	2.10E-03		
Silver	5.08E-05	6.40E-06		
Thallium	4.50E-04	5.67E-05		
Toluene			8.32E-04	1.05E-04
Xylene			5.80E-04	7.31E-05

G. PSD Significant Impact Analysis

Table VII-7 presents the results of the PSD modeling and monitoring significance analysis for the primary operating scenario. Only PM_{10} and NO_2 exceed the modeling significance thresholds and PM_{10} is the only pollutant to exceed the monitoring significant threshold. Consequently, full impact analyses are required for these two pollutants. The significant impact area was shown to extend to a distance of 2.5 km, as a result of the 24-hour PM_{10} impacts.

Table VII-7. PSD Modeling and Monitoring Significance Analysis – Primary Operating Scenario

Pollutant	Averaging Period	Modeling Signif. Level (ug/m3)	Signif. Monitoring Conc. (ug/m3)	Maximum Modeled Conc. (ug/m3)	Above Modeling Signif. Level?	Above Monitoring Conc.?
CO	1-hour	2000	-	635[a]	No	-
	8-hour	500	575	192[a]	No	No
NO_2	Annual	1	14	1.49[b]	Yes	No
PM10	24-hour	5	10	28.4[c]	Yes	Yes
	Annual	1	-	10.2[c]	Yes	-

[a] CO impacts based upon August 2005 modeling submittal
[b] NO_2 impacts are based upon 75% assumed conversion of NO to NO_2.
[c] PM10 impacts based upon the January 2005 modeling submittal.

Table VII-8 presents the results of the significant impact analysis for the alternative operating scenario. Only PM_{10} was modeled, as emissions of other pollutants were the same under both scenarios. The maximum model-predicted PM_{10} impact exceeded both the modeling and monitoring significance threshold for PM_{10}; thus, a full impact analysis is also warranted for the alternative operating scenario. The significant impact area was shown to extend to a distance of just less than 2.5 km, as a result of the 24-hour PM_{10} impacts from the alternative operating scenario.

Table VII-8 PSD Modeling and Monitoring Significance Analysis – Alternative Operating Scenario

Pollutant	Averaging Period	Modeling Signif. Level (ug/m3)	Signif. Monitoring Conc. (ug/m3)	Maximum Modeled Conc. (ug/m3)	Above Modeling Signif. Level?	Above Monitoring Conc.?
PM10	24-hour	5	10	29.2	Yes	Yes
	Annual	1	-	10.2	Yes	-

As mentioned above, modeled PM_{10} impacts exceeded the monitoring significance threshold. The PSD Monitoring Guidelines state that existing monitoring data should be representative of three types of areas: (1) the location(s) of maximum concentration increase from the proposed source or modification, (2) the locations(s) of the maximum air pollutant concentration from existing sources, and (3) the location(s) of the maximum impact area, i.e., where the maximum pollutant concentration would hypothetically occur based on the combined effect of existing sources and the proposed new source or modification. Basically, the locations and size of the three types of area are determined through the application of air quality models. The areas of maximum concentration or maximum combined impact vary in size and are influenced by factors such as the size and relative distribution of ground level and elevated sources, the averaging times of concern, and the distances between impact area and contributing sources.

For situations in which the proposed source or modification will be constructed in an area that is generally free from the impact of other point sources and area sources associated with human activities, then monitoring data from a "regional" site may be used as representative data. Such a site could be out of the maximum impact area, but must be similar in nature to the impact area. This site would be characteristic of air quality across a broad region including that in which the proposed source or modification is located.

The Department has concluded that the proposed site of the Drake Cement facility meets these criteria. Therefore, the Department has allowed the use of the PM_{10} monitoring data from the Yavapai County monitoring station in Clarkdale, Arizona to satisfy the PM_{10} monitoring requirement for Drake Cement. Hence, the Permittee was not required to conduct pre-construction PM_{10} monitoring.

H. NAAQS Analysis

In addition to the Drake Cement criteria pollutant sources, the NAAQS inventory included offsite sources within 50 km of the significant impact area. These sources were Phoenix Cement in Clarkdale, the El Paso Natural Gas compressor station in

Williams, the Fann Asphalt Plant, and the Prescott water pumping station. Although the emission inventory for Phoenix Cement did not include fugitive dust sources, most of these are ground level sources (e.g. fugitive dust from roads, storage piles, etc.) which are not likely to be transported to within the significant impact area of Drake Cement, and as such, need not be included. A complete listing of the offsite NAAQS emission inventory is documented in Appendix B of the January 2005 modeling report.

The results of the NAAQS analysis are presented in Table VII-9 for the primary operating scenario and in Table VII-10 for the alternative operating scenario. In all cases, the impacts are far less than the NAAQS.

Figure VII-12 illustrates the location of the maximum model-predicted impacts of NO_2 and PM_{10}. The figure is rotated such that north is located on the left side of the image. For the primary operating scenario, the location of the maximum annual NO_2 impact is approximately 300 meters northeast of the main facility. The location of the maximum annual model-predicted PM_{10} impact is within 100 meters south of the main processing facility. The maximum model-predicted 24-hour PM_{10} impact occurred on the west side of the quarry. For the alternative operating scenario, the location of both the NO_2 and annual PM_{10} are the same as during the primary operating scenario. However, the location of the maximum 24-hour PM_{10} occurs just outside of the southeast side of the main processing area.

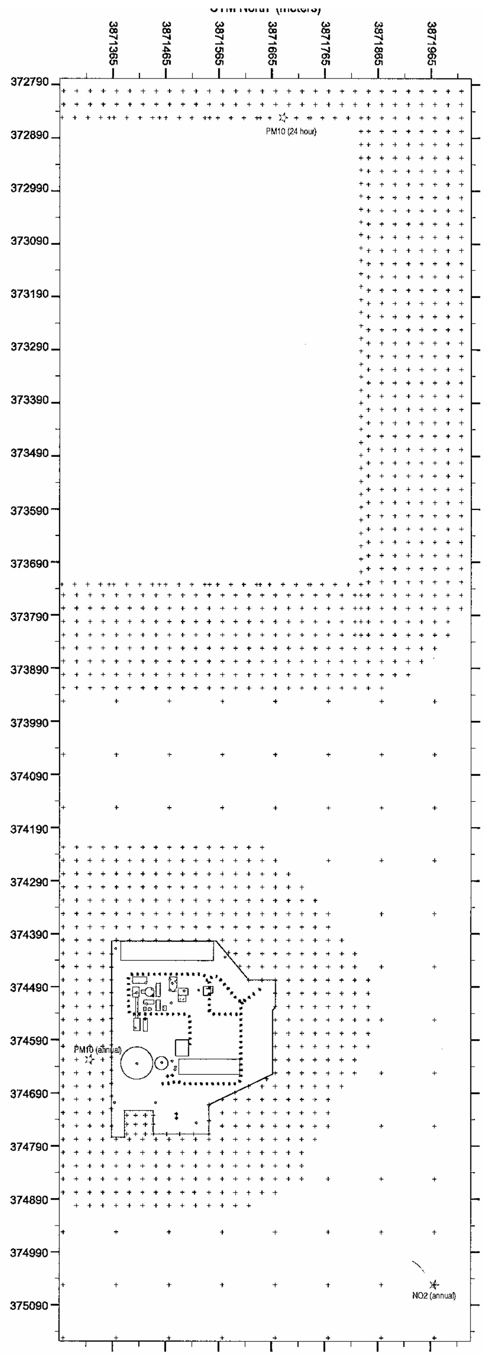
Table VII-9. NAAQS Compliance Analysis for the Primary Operating Scenario

Pollutant	**Averaging Period**	**NAAQS (ug/m3)**	**Maximum Modeled Conc. (ug/m3)**	**Background Conc. (ug/m3)**	**Total Predicted Conc. (ug/m3)**	**Percent of NAAQS**
NO_2	Annual	100	1.65	4.0	5.65	6%
PM_{10}	24-hour	150	28.6	31.0	59.6	40%
	Annual	50	10.3	15.0	25.3	51%

Table VII-10. NAAQS Compliance Analysis for the Alternative Operating Scenario

Pollutant	**Averaging Period**	**NAAQS (ug/m3)**	**Maximum Modeled Conc. (ug/m3)**	**Background Conc. (ug/m3)**	**Total Predicted Conc. (ug/m3)**	**Percent of NAAQS**
PM_{10}	24-hour	150	29.2	31.0	60.2	40%
	Annual	50	10.2	15.0	25.2	50%

Figure VII-12. Location of Maximum Impacts for the NAAQS Analysis



I. PSD Class II Area Increment Consumption

In addition to the Drake Cement criteria pollutant sources, the PSD increment inventory included offsite sources within 50 km of the significant impact area. These sources were Phoenix Cement in Clarkdale, the El Paso Natural Gas compressor station in Williams, the Fann Asphalt Plant, and the Prescott water pumping station. Existing increment consuming sources may be modeled at their actual emission rates, not necessarily their potential emission rates. However, for simplicity, both Phoenix Cement and El Paso Natural Gas were modeled at their potential (i.e., permit allowable) emission rates. The minor sources include Fann Asphalt and Prescott water pumping station, which were modeled at their most recently reported actual emission rates. Details of these sources are listed in Appendix B of the January 2005 modeling report.

Table VII-11 presents a summary of results for the PSD Class II area increment analysis for the primary operating scenario, and Table VII-12 present the results for the alternative operating scenario. The NO_2 increment consumption is less than 10 percent of the allowable increment. The analysis also showed that 85 percent of the available increment would be consumed for the 24-hour PM_{10} analysis during the primary operating scenario, and slightly more during the alternative operating scenario. The annual PM_{10} impacts will consume 61 percent of the increment. Hence, the proposed project, in conjunction with other nearby sources is not predicted to exceed the allowable PSD increment consumption in Class II areas. The location of the maximum increment consumption in the Class II area occurs at the same location of the maximum NAAQS impacts.

Table VII-11 Summary of PSD Class II Area Increment Analysis – Primary Operating Scenario

Pollutant	**Averaging Period**	**Maximum Modeled Conc. (ug/m3)**	**PSD Increment**	**Percent of Increment Consumed**
NO2	Annual	1.65	25	7 %
PM_{10}	24-hour Annual	28.6 10.3	30 17	95 % 61 %

Table VII-12 Summary of PSD Class II Area Increment Analysis – Alternative Operating Scenario

Pollutant	**Averaging Period**	**Maximum Modeled Conc. (ug/m3)**	**PSD Increment**	**Percent of Increment Consumed**
PM_{10}	24-hour Annual	29.2 10.2	30 17	97 % 60 %

J. The AAAQG Pollutant Impact Analysis

The AAAQG pollutant analysis was conducted by comparing the combined impact from the main stack and the diesel emergency generator stack with the AAAQG levels. The maximum model-predicted impacts of each AAAQG pollutant from the main stack was identified by using a unit emission rate (1 g/sec) and multiplying the ambient impact by the applicable time-averaged emission rate for each pollutant. The process was repeated for the emergency generator. Although the time-averaged impact from each of these sources occurs at separate locations and times, the two impacts were summed to obtain a conservative estimate of the total impact for each AAAQG pollutant. The results of this impact analysis are shown in Table VII-13 for each pollutant and averaging time. For all AAAQG pollutants, the maximum total impact is below the corresponding AAAQG levels.

Table VII-13. AAAQG Pollutant Impact Analysis

Compound	**Max 1-Hr Impact (ug/m3)**	**1-Hour AAAQG (ug/m3)**	**Max 24-Hr Impact (ug/m3)**	**24-Hour AAAQG (ug/m3)**	**Max Annual Impact (ug/m3)**	**Annual AAAQG (ug/m3)**
1,3 butadiene	8.54E-03	7.20E+00	3.56E-04	1.90E+00	1.59E-05	6.70E-02
Acetaldehyde	1.68E-01	2.30E+03	6.98E-03	1.40E+03	3.12E-04	5.00E-01
Acrolein	2.02E-02	6.70E+00	8.41E-04	2.00E+00	3.75E-05	-
Ammonia as NH3	1.06E+01	-	1.19E+00	1.40E+02	1.02E-02	-
Arsenic	2.11E-03	2.80E-01	2.39E-04	7.30E-02	2.05E-05	2.00E-04
Barium	8.09E-02	1.50E+01	9.14E-03	4.00E+00	7.84E-04	-
Benzene	3.01E+00	6.30E+02	3.26E-01	5.10E+01	2.76E-02	1.40E-01
Benzo(a)anthracene	3.75E-04	7.90E-01	1.62E-05	2.10E-01	7.56E-07	5.70E-04
Benzo(a)pyrene	1.16E-04	6.00E-02	4.29E-06	2.10E-01	2.97E-07	5.70E-04
Beryllium	1.16E-04	6.00E-02	1.31E-05	1.60E-02	1.13E-06	5.00E-04
Cadmium	3.87E-04	1.70E+00	4.36E-05	1.10E-01	3.74E-06	2.90E-04
Chromium	2.47E-02	1.10E+01	2.79E-03	3.80E+00	2.39E-04	-
Copper	9.34E-01	2.30E+00	1.05E-01	7.50E-01	9.04E-03	-
Dibenz(a,h)anthracene	2.39E-04	-	1.78E-05	2.10E-01	1.31E-06	5.70E-04
Dioxins	4.75E-07	-	5.37E-08	-	4.60E-09	-
Dibenzofurans	5.11E-08	-	5.77E-09	-	4.95E-10	-
Formaldehyde	3.39E-01	2.00E+01	1.99E-02	1.20E+01	1.26E-03	8.00E-02
Hydrochloric Acid	2.47E+01	2.10E+02	2.79E+00	5.60E+01	2.39E-01	7.00E+00
Mercury	4.22E-03	1.50E+00	4.77E-04	4.00E-01	4.09E-05	-
Naphthalene	3.18E-01	6.30E+02	3.46E-02	4.00E+02	2.94E-03	-
Propylene oxide	5.64E-01	1.50E+03	2.35E-02	4.00E+02	1.05E-03	2.00E+00
Selenium	3.53E-02	6.00E+00	3.98E-03	1.60E+00	3.42E-04	-
Silver	1.07E-04	3.00E-01	1.21E-05	7.90E-02	1.04E-06	-
Thallium	9.51E-04	3.00E+00	1.07E-04	7.90E-01	9.21E-06	-
Toluene	8.94E-02	4.70E+03	3.72E-03	3.00E+03	1.66E-04	-
Xylene	6.23E-02	5.50E+03	2.60E-03	3.50E+03	1.16E-04	-

K. Class I Area Impact Analysis

The Class I Area impact analysis consisted of three components: the PSD increment consumption analysis, the visibility analysis, and the acid deposition analysis. Each of these is discussed below.

1. PSD Increment Analysis

The Class I Area PSD increment consumption analysis was conducted to determine if Drake Cement could cause or contribute to the exceedance of the PSD Class I area increments. The analysis was originally conducted for NO_2, PM10, and SO_2, as presented in Drake Cement's January 2005 modeling submittal. Since then, Drake has proposed to reduce its SO_2 levels below the PSD significance emissions thresholds. Therefore, only the results for NO_2 and PM_{10} are presented here. Additionally, Drake and ADEQ have agreed to BACT for NOx, which reduced Drake's NOx emissions to half of those modeled in the January 2005 CALPUFF modeling files.

In developing the 1996 proposal for New Source Review Reform, the U.S. Environmental Protection Agency (EPA) determined that, as long as no individual source contribution exceeds 4 percent of a Class I increment, it is unlikely that the accumulation of source over time will exceed that increment. As such, this 4 percent threshold is used as a "significance levels" for determining the need for a cumulative source impact analysis to demonstrate compliance with the Class I increments.

Table VII-14 presents the results of the Class I Area PSD significance analysis as presented in the January 2005 modeling report. The maximum model-predicted impacts were all below the PSD Class I significance levels. In the January 2005 modeling analysis, worst-case NO_2 impacts at the Yavapai Apache Reservation did exceed the 4 percent significance threshold, but since have been reduced in proportion to the decrease in NOx emissions.

Table VII-14. Summary of Class I Area Significance Analysis Results

Class I Area	Maximum Model-Predicted Concentration (ug/m3)[a]		
	NO_2	PM_{10}	
	Annual	24-Hour	Annual
Sycamore Canyon	0.0674	0.260	0.0141
Yavapai Apache Reservation	0.074	0.164	0.0338
Pine Mountain Wilderness	0.0753	0.0827	0.0188
Mazatzal Wilderness	0.0142	0.0635	0.0066
Grand Canyon National Park	0.0491	0.0801	0.0134
Superstition Wilderness	0.00096	0.0240	0.0013
Class I Significance Levels	0.1	0.3	0.2

[a] Surface maximum concentrations for Sycamore Canyon were evaluated using ISC3. All other concentrations were obtained from the CALPUFF Screening Analysis.

[b] NO_2 impacts at Yavapai Reservation were reported as 0.148 in the January 2005 modeling analysis, but were since decreased to half of this value as in proportion to the revised emission inventory of August 2005.

The Department performed additional analyses for Sycamore Canyon to investigate the potential impacts of both Drake Cement and Phoenix Cement. Drake Cement is located 23 km west of Sycamore Canyon and Phoenix Cement is located 9 km south of Sycamore Canyon. Because of the complex nature of the terrain and affected flow patterns in the area, a 3-dimensional wind field model generated by CALMET was used in conjunction with the CALPUFF model to evaluate impacts at Sycamore Canyon.

The results of that study demonstrated that the impacts from Drake and Phoenix Cement are not cumulative. The maximum impacts are separate from these two facilities, occurring at different locations and under different meteorological conditions.

2. Visibility Analysis

Visibility impairment is mostly likely to manifest itself either by (1) the contrast or color difference between a layer or plume and a viewed background such as a landscape feature or sky (i.e., plume blight), or (2) in the form of a general alteration in the appearance of a landscape feature or the sky (i.e., regional haze). The Federal Land Managers generally differentiate between these two manifestations as a function of distance from the source. Visibility impairment from sources within 50 km of a view is usually calculated using contrast and color differences, where visibility impairment from a source greater than 50 km from a view or the aggregation of a number of plumes, regardless of distance is usually calculated using the change in light extinction.

Because source emissions from the project impact Class I areas both within and beyond 50 km, both types of visibility analyses were conducted.

a. Regional Haze Analysis

For Class I areas beyond 50 km from the project, model-predicted light extinction was quantified and compared with the Federal Land Manager's Level of Concern. The Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report (December 2000) states "The [Federal Land Managers] are concerned about situations where a change in extinction from new source growth is greater than 5 percent as compared against natural conditions. Changes in extinction greater than 10 percent are generally considered unacceptable by the [Federal Land Managers] and will likely raise objections to further pollutant loading without mitigation. These levels are usually applied for distant/multi-source analyses where sources are located more than 50 km from a view or for analyzing the visibility impairment from an aggregation of plumes from multiple sources, regardless of distance." As such, the contribution to light extinction from the proposed project was quantified and compared with the 5 percent level of concern.

Drake Cement submitted a regional haze analysis for the six Class I areas in its January 2005 modeling submittal. The visibility analysis was conducted using CALPUFF in a screening mode and compared with the Federal Land Manager's level of concern (5 percent change in light extinction as compared with natural background conditions).

The results are presented in Table VII-15. Impacts exceeded the Federal Land Manager's Level of Concern at Sycamore Canyon. The screening analysis showed that 10 days in five years could exceed the 5 percent threshold.

Table VII-15. Summary of Visibility Impacts at Class I Areas

Class I Area	Maximum Change in Light Extinction (%ΔB_{ext})
Sycamore Canyon Wilderness	6.97%
Yavapai-Apache Wilderness	4.74%
Pine Mountain Wilderness	3.55%
Mazatzal Wilderness	3.06%
Grand Canyon National Park	3.47%
Superstition Wilderness	1.05%

Therefore Drake Cement conducted a refined visibility analysis solely for Sycamore Canyon in an attempt to demonstrate impacts below the Federal Land Manager's level of concern. Surprisingly, the results from their refined analyses showed slightly higher impacts, all occurring along the western side of Sycamore Canyon. As Drake investigated the cause for the model-predicted impacts, they concluded that they only occurred during periods that visibility would be obstructed (as during inclement whether) or during the night, when haze would not be visible.

The Department was never able to substantiate these claims as Drake Cement did not provide the necessary modeling files (i.e., CALMET input files, preprocessing files, and input data). Therefore, the Department performed its own visibility analyses for Sycamore Canyon. The Department reconstructed two years of meteorological data using both the on-site data from Drake Cement (2001) and the on-site data from Phoenix Cement (1990). Modeling was conducted using the emission rates contained the January 2005 modeling report.

The results from the Department's analysis showed that Drake Cement could exceed the Federal Land Manager's level of concern a few days each year, with maximum impacts of 10.6 percent ΔB_{ext}. The primary culpable species was ammonium nitrate (NH_4NO_3) of which NO_X is a contributing species.

The Department also looked at the cumulative impacts of Drake Cement and Phoenix Cement. The results showed that the impacts from Drake Cement occur along the western side of Sycamore Canyon and the impacts from Phoenix Cement occurred along the southern side of Sycamore Canyon. The impacts occurred under different meteorological conditions, and hence were not cumulative.

b. Plume Blight Analyses

Sycamore Canyon is the only Class I area located within 50 km of the proposed Drake Cement facility. VISCREEN was used to quantify the visual impact from a cohesive plume emanating from the project to Sycamore Canyon. The methodology followed EPA's guidelines as presented in the Workbook for Plume Visual Impact Screening and Analysis (USEPA 1988, revised 1992). A multi-step approach is recommended in which one begins with a very conservative set of assumptions (Level 1) and moves toward more refined analysis (Levels 2 and 3) in the event that the more conservative assumptions exceed threshold criteria.

The Federal Land Managers' Air Quality Related Values Work Group (FLAG), Phase I Report (December 2000) states "If a screening analysis of a new or modified source can demonstrate that its emissions will not cause a plume with any hourly estimates of the color difference index ($\triangle$E) greater than or equal to 2.0, or the absolute value of the contrast values ($|C|$) greater than or equal to 0.05, the FLM is not likely to object to the issuance of the PSD permit based on near field visibility impacts and no further near field visibility analyses will be requested." These levels were used as the applicable thresholds.

Level II implies that the conservative assumptions contained in the Level I analysis were not sufficient to demonstrate compliance with the Class I area visibility thresholds. Level I conservative assumptions do not take into account the meteorology associated with transport in the direction of the Class I area of concern. Level II allows the applicant to take into account actual wind directions as determined from a joint frequency distribution of winds from a representative meteorological station. Drake Cement appropriately utilized its on-site meteorological data for this analysis.

The plume blight analysis considers the geometry of the plume, observer, viewing background, and the sun. VISCREEN provides results for two assumed worst-case sun angles. The forward scattering case refers to a situation in which the sun is I from of the observer such that the scattering angle (theta) is 10°. Such an angle will tend to maximize the brightness of the plume. (In reality, such a sun angle may or may not occur during worst-case conditions for the given line of sight.) The backward scatter case refers to a situation in which the sun is behind the observer such that the scattering angle is 140°. A plume is likely to appear the darkest with such a sun angle. Both of these views are simulated against two viewing backgrounds. A sky background is used which maximizes the contrast of a dark plume, whereas a terrain background is used which maximizes the contrast of a light colored plume.

Table VII-16 presents the results of the Level II Plume Blight Analysis for Sycamore Canyon. The results reveal that the plume would be visible against a sky background for both the forward and backward scattering case (i.e., Delta E greater than or equal to 2.0). This is based upon worst-case meteorological conditions of F stability (very stable) and wind speeds of 1.5 m/sec.

Due to the complexity of the terrain in combination with meteorology, it is unlikely that the event will occur. The maximum predicted plume height (4970 ft) is less than the elevation of Sycamore Canyon (6200 feet). As such, the elevation of the terrain during stable conditions would hinder the eastward drift of the plume. The complexity of the terrain would also promote increased dispersion of the plume, making it less likely that the plume would be intact when it reached an observer at the wilderness boundary.

Consideration of local meteorological conditions and the time of day when worst-case meteorological conditions could actually occur also suggest that an observer would not see a visible plume. The wind vectors that could transport the plume toward Sycamore Canyon occur 10.1 percent of the time. Of these hours, the worst-case meteorology (stability class 6, wind speed 1.5 m/sec) occurs most frequently between 1:00 am and 6:00 am. These conditions do not occur at all during the hours of 7:00 am and 12:00 p.m. The hours of 1:00 p.m. through 7 p.m. see an increase in more stable conditions; however, the frequency of occurrence does not become significant until the final six hours of the day. This indicates that the infrequent possibility of a visible plume from the Drake Cement facility at Sycamore Canyon will generally occur during the night, and diminish as the sun rises and atmospheric instability increases.

Table VII-16. Results of Level II Plume Blight Analysis for Sycamore Canyon

Maximum Visual Impacts Inside Sycamore Canyon Class I Wilderness Area						
Background	Theta	Azi	Distance	Alpha	Delta E	Contrast
Sky (forward)	10	157	43	11	3.095	-0.002
Sky (backward)	140	157	43	11	2.272	-0.027
Terrain (forward)	10	84	22	84	1.483	0.008
Terrain (backward)	140	84	22	84	0.332	0.001

3. Acid Deposition Analysis

Acid deposition is characterized by the acid containing species nitrogen and sulfur. Nitrogen and sulfur deposition rates due to Drake Cement sources in the six Class I areas were predicted using the CALPUFF in a screening mode. The results are compared with the Federal Land Manager's deposition analysis thresholds of 0.005 kg/ha-yr for nitrogen and 0.005 kg/ha-yr for sulfur in the western United States.

Table VII-17 presents the results of the nitrogen and sulfur deposition analysis in Class I areas for both operating scenarios. The modeling results are based upon the emission inventory contained in the January 2005 modeling report.

Table VII-17. Summary of Maximum Nitrogen and Sulfur Deposition Rates in Class I Areas

Class I Area	**Maximum Nitrogen Deposition (kg/ha-yr)**	**Maximum Sulfur Deposition (kg/ha-yr)**
Sycamore Canyon Wilderness	2.15E-02[a]	5.99E-03
Yavapai-Apache Wilderness	1.81E-02	1.95E-03
Pine Mountain Wilderness	9.92E-03	1.10E-03
Mazatzal Wilderness	3.28E-03	4.69E-04
Grand Canyon National Park	6.95E-03	7.89E-04
Superstition Wilderness	9.90E-04	1.67E-04
Deposition Analysis Thresholds	**5.00E-03**	**5.00E-03**

[a] Nitrogen impacts at Sycamore Canyon were originally modeled at 5.88E-02 in the January 2005 modeling report.

4. FLM Review

The FLM reviewed the visibility impact analysis, and provided three recommendations. The first recommendation is for Drake Cement to perform ambient monitoring to demonstrate the actual impacts from the facility. Drake Cement has agreed to monitor PM10, PM2.5 and nitrogen deposition, using monitor locations that will be approved by ADEQ and the FLM. Drake Cement has agreed to start collecting data at least 1 year before plant operation, and to continue for the first three years of operation. Should the 3 years of monitored data at these proposed stations have higher concentrations of nitrogen deposition than modeled, which can be attributed to Drake Cement plant operations, then Drake Cement will present a contingency plan to ADEQ that may include the reduction of plant production or implementation of a new emission reduction technology.

The second FLM recommendation is that Drake Cement use mitigation measures to reduce NOx and PM emissions. Drake Cement agrees to purchase the latest design possible for the trucks, front loaders and other engine-driven equipment to reduce NOx emissions. Drake Cement will enter into a Letter of Intent with both the FLM and ADEQ to implement these reductions.

The final FLM recommendation is that Drake Cement acquire NOx offsets for the actual amount of emissions in excess of 100 tons per year. Currently, there is no established emission credit market in the State of Arizona. If emission credits are purchased from another area (such as California), there will not be a positive impact on visibility at the Sycamore Canyon area. However, in order to provide some certainty relating to nitrogen deposition, Drake Cement is voluntarily accepting an ammonia emission limit in its permit.

L. Additional Impact Analyses

There are four parts to the additional impact analysis: (1) growth, (2) ambient air quality impact analyses, (3) soils and vegetation impacts, and (4) visibility.

1. Growth Analysis

The projected growth from the project includes residential, industrial, and economic growth. Impacts from growth have not been quantified as so much uncertainty is associated with the underlying assumptions. However, the following speculations have been made.

Residential development near the project site will not be promoted by the project because of lack of residential infrastructure in the area. It is more likely that employees will be drawn from the closest population centers experiencing growth such as the towns of Chino Valley, Paulden, and Ash Forks.

Industrial and economic growth in the region will likely be promoted by the

Drake Cement project. In addition to the Drake Cement employees, it would be anticipated that supporting industries will develop in the area over time to service the facility. Such operations may include pipe and fitting suppliers, facility maintenance firms, metal fabrication and repair shops, and other similar enterprises.

The roadway and railroad infrastructure in the Project area are established corridors for agricultural and commercial traffic connecting the Prescott/Chino Valley/Clarkdale area and other areas of the state. There will be an incremental increase in vehicle and rail traffic in the area due to employee travel, material delivery and shipment connected with the operations of the facility. The expected increase in traffic is approximately 95 vehicles per day.

2. Ambient Air Quality Impact Analysis

Because the emissions from growth were not quantified, an ambient air quality impact analysis was not performed.

3. Effects on soils and vegetation.

Construction of the project would potential disturb less than 100 acres of grassland and scrub oak/juniper forest. The vicinity of the Drake Cement site does not represent unique habitat and as found by inquiry to the Arizona Department of Game and Fish, and the U.S. Fish and Wildlife Service. Consequently, no significant loss of habitat for sensitive native flora and fauna would occur.

The impacts from Drake Cement were also compared with the sensitive vegetation thresholds listed in EPA's *Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals*. As shown in Table VII-18, the maximum impacts from Drake Cement are all below the screening thresholds.

Table VII-18. Screening Concentrations for Exposure to Ambient Air Concentrations

Pollutant	Averaging Time	Maximum Predicted Impact (μg/m^3)	Sensitive (μg /m^3)
SO_2	1-hour	-	917
	3-hour	21	786
	Annual	0.1	18
O_3	1-hour	-	392

	4-hour 8-hour	- -	196 118
NO_2	4-hour 8-hour 1 month Annual	- - - 1.5	3760 3760 564 94-188
CO	1 week 1-hour 8-hour	- 635 192	1,800,000 - -
Beryllium	1-hour 1-day 1 month Annual	1.16E-4 1.31E-05 - 1.13E-06	- - 0.01 -

4. Visibility Analysis

The Federal Land Manager requested that a near-field plume visibility analysis be performed to assess the potential for plume blight for the Class II wilderness areas within a 50 km radius of the Drake Cement project site. Near-field plume visibility modeling was conducted following the procedures specified in the EPA Workbook for Plume Visual Impact Screening and Analysis (Revised). Table VII-19 presents the Wilderness Areas included in the analysis

Table VII-19 Wilderness Areas Included in the Plume Blight Analysis

Wilderness Area	**Distance and Direction from Drake Cement**
Granite Mountain Wilderness	36 km Southwest
Woodchute Wilderness	26 km Southeast
Juniper Mesa Wilderness	46 km West
Apache Creek Wilderness	45 km West
Red Rock – Secret Mountain Wilderness	35 km East

The Federal Land Managers' Air Quality Related Values WorkGroup (FLAG), Phase I Report (December 2000) states "If a screening analysis of a new or modified source can demonstrate that its emissions will not cause a plume with any hourly estimates of the color difference index (ΔE) greater than or equal to 2.0, or the absolute value of the contrast values ($|C|$) greater than or equal to 0.05, the [Federal Land Manager] is not likely to object to the issuance of the PSD permit based on near field visibility impacts and no further near field visibility analyses will be requested." These levels were used as the applicable thresholds.

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Table VII-20 presents a summary of the visibility analyses for Class II Wilderness Areas located within 50 km of the proposed Drake Cement plant. The maximum model-predicted impacts from Drake Cement are less than FLM's level of concern (Delta E >2.0, Absolute value of contrast >0.05).

Table VII-20 Summary of Visibility Analysis for Class II Wilderness Areas

Granite Mountain Wilderness Area						
Background	**Theta**	**Azi**	**Distance**	**Alpha**	**Delta E**	**Contrast**
Sky (forward)	10	132	46	37	0.886	-0.000
Sky (backward)	140	132	46	37	0.688	-0.006
Terrain (forward)	10	84	37	84	0.510	-0.004
Terrain (backward)	140	84	37	84	0.164	0.001
Woodchute Wilderness Area						
Sky (forward)	10	136	36	33	1.850	-0.001
Sky (backward)	140	136	36	33	1.452	-0.013
Terrain (forward)	10	84	28	84	1.145	0.008
Terrain (backward)	140	84	28	84	0.307	0.001
Red Rock –Secret Mountain Wilderness Area						
Sky (forward)	10	154	61	14	1.878	-0.001

Sky (backward)	140	154	61	14	1.332	-0.018
Terrain (forward)	10	84	35	84	0.899	0.007
Terrain (backward)	140	84	35	84	0.280	0.001
Juniper Mesa Wilderness Area						
Sky (forward)	10	120	53	49	0.167	0.000
Sky (backward)	140	120	53	49	0.130	-0.000
Terrain (forward)	10	84	46	84	0.101	0.001
Terrain (backward)	140	84	46	84	0.037	0.000
Apache Creek Wilderness Area						
Sky (forward)	10	124	53	45	0.175	0.000
Sky (backward)	140	124	53	45	0.136	-0.001
Terrain (forward)	10	84	45	84	0.104	0.001
Terrain (backward)	140	84	45	84	0.037	0.000

VIII. LIST OF ABBREVIATIONS

AAAQG....................Arizona Ambient Air Quality Guideline
A.A.C....................Arizona Administrative Code
ADEQ....................Arizona Department of Environmental Quality
AQRV....................Air Quality Related Value
BACT....................Best Available Control Technology
Btu....................British Thermal Units
CAM....................Compliance Assurance Monitoring
CEMS....................Continuous Emission Monitoring System
CERMS....................Continuous Emission Rate Monitoring System
CFR....................Code of Federal Regulations
CO....................Carbon Monoxide
CO_2....................Carbon Dioxide
COMS....................Continuous Opacity Monitoring System
DEM....................Digital Elevation Model
dscf....................Dry Standard Cubic Foot
EPA....................Environmental Protection Agency
^{o}F....................Degrees Fahrenheit
GEP....................Good Engineering Practice
H_2O....................Water
hp....................Horsepower
lb/hr....................Pound per Hour
$\mu g/m^3$....................Microgram per Cubic Meter
kW....................Kilowatt
kW·hr....................Kilowatt hour
NAAQS....................National Ambient Air Quality Standard
N_2....................Nitrogen
NESHAP....................National Emission Standards for Hazardous Air Pollutants
NH_3....................Ammonia
NO....................Nitrogen Oxide

NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NSPS	New Source Performance Standards
NSR	New Source Review
O_2	Oxygen
O_3	Ozone
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter Nominally less than 10 Micrometers
ppm	Parts per Million
ppmvd	Parts per Million by Dry Volume
PSD	Prevention of Significant Deterioration
PTE	Potential-to-Emit
RBLC	RACT/BACT/LAER Clearinghouse
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
THC	Total Hydrocarbons
tpy	Tons per Year
TSP	Total Suspended Particulates
USGS	United States Geological Services
VOC	Volatile Organic Compound